ID No. K115577
- RETURN TO -
INSTRUMENT CONTROL
SYLVANIA SES -- West

MK 6300
TEMPERATURE CHAMBER
MANUAL

DELTA DESIGN
INC.

LA MESA, CALIFORNIA

ENVIRONMENTAL CONTROL EQUIPMENT FOR RESEARCH AND INDUSTRY

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S/N 0-16-4

DELTA DESIGN INC
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DELTA DESIGN, INC.

La Mesa, California

MK 6300 CHAMBER

PRECAUTIONS

(1) Connect SAFETY PLUG (rear of chamber) when external programmer is not being used. This will preclude any accidental high temperature being obtained if the MODE switch is placed in the PROGRAM position with no programmer connected.

(2) Unplug the chamber from all sources of power before attempting any type of servicing or removal of the controller chassis. The case of the SCR Switch assembly, located on the controller sub-assembly, is at power line potential and extreme care in servicing or calibration must be exercised.

(3) Do not block the inlet of the vent fan (right side of chamber) or outlet of controller area on bottom of the chamber (right side) as forced draft cooling is required for proper operation of the unit.

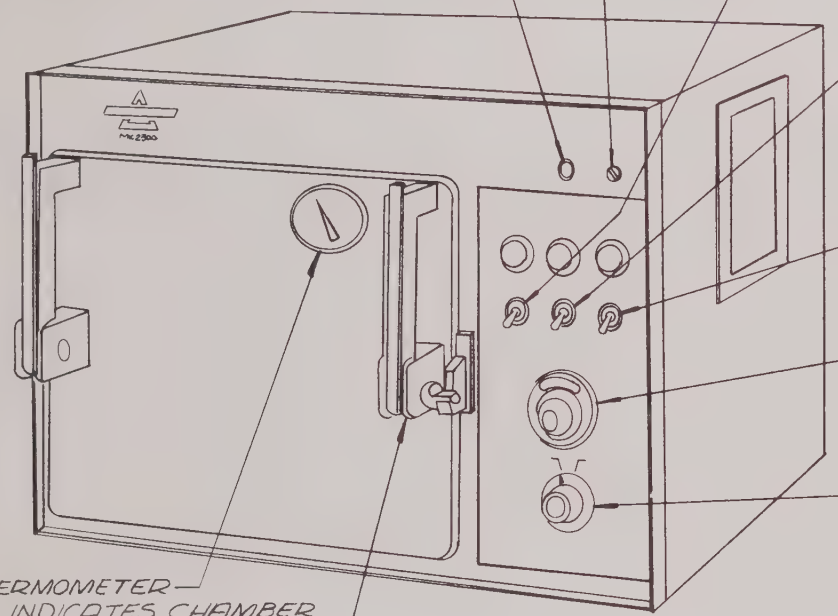
(4) Ensure that the correct type of LCO_2 (liquid carbon dioxide) source is connected to the chamber before operating at low temperature. Test the LCO_2 for cleanliness by discharging a quantity of it through a clean white handkerchief. Bits of rust and traces of oil, ice or water indicate contaminated LCO_2 which should not be used.

(5) Ground the case of the chamber to earth ground. When a grounded outlet is not available, use the three-to-two adaptor (supplied with the chamber) and connect the green colored "pigtail" to earth ground. The chamber must not be operated without the case grounded.

(6) Operate the chamber at a temperature of 400°F for an hour after prolonged operation at low temperatures. This restores the efficiency of the insulating material by driving out the moisture which has been condensed out of the air.

(7) CAUTION - Liquid oxygen may be formed in the insulation when the chamber is operated at temperatures of -297°F and below. Any mixture of oil and liquid oxygen can be explosive. If oil contamination is suspected, bake the chamber out by operating it at a temperature of 400°F for a period of 3 hours before taking it to extremely low temperatures.

(8) Do not leave liquid nitrogen trapped in a line (valves closed at both ends) as high pressures will be developed as the liquid absorbs heat and becomes gas.



FAILSAFE ADJUSTMENT— TURN TO CHANGE TEMPERATURE AT WHICH FAILSAFE WILL TRIP.
CAUTION: DO NOT LOWER FAILSAFE TEMP SETTING UNLESS HEAT SW. IS ON & FAILSAFE IS OFF.

FAILSAFE LIGHT— GLOWS RED WHEN FAILSAFE IS TRIPPED.

THERMOMETER— INDICATES CHAMBER TEMP. IN TEST VOLUME.

CAM ACTION HANDLES: PULL LEVER FULL DOWN TO RELEASE

OPERATING INSTRUCTIONS: INSTALL THE CHAMBER, CONNECT POWER CORD TO SUITABLE OUTLET & COOLANT SUPPLY TO VALVE INLET AT REAR OF CHAMBER. AS DESCRIBED ON PAGE 15 THROUGH 16

FOLLOW THE ARROWS:

5 HEAT SWITCH & LIGHT--SWITCH ON--ON POSITION ALLOWS CONTROLLER TO APPLY HEAT AUTOMATICALLY TO MAINTAIN SELECTED TEMPERATURE IN CHAMBER. RED LIGHT IS ON STEADY WHEN CHAMBER IS HEATING. BLINKS WHEN CHAMBER REACHES SELECTED TEMPERATURE ABOVE AMBIENT.

4 COOL SWITCH & LIGHT--SWITCH ON--ON POSITION ALLOWS CONTROLLER TO APPLY COOLANT AUTOMATICALLY TO MAINTAIN SELECTED TEMPERATURE IN CHAMBER. GREEN LIGHT IS ON STEADY WHEN CHAMBER IS COOLING.

3 POWER SWITCH & LIGHT-- SWITCH ON. MAIN POWER ON. WHITE LIGHT GLOWS WHEN POWER IS ON.

2 TEMPERATURE SET DIAL-- SET TO DESIRED TEMPERATURE. SELECTS CHAMBER TEMPERATURE IF MODE SWITCH IS IN MANUAL POSITION.

1 MODE SWITCH-- SET TO MANUAL POSITION. ASSIGNS THE SELECTION OF CHAMBER TEMPERATURE TO TEMPERATURE SET DIAL OR EXTERNAL PROGRAMMER.

MANUAL POSITION: TEMPERATURE SET DIAL DETERMINES CHAMBER TEMPERATURE.

PROGRAM POSITION: PROGRAMMING RESISTANCE CONNECTED TO PROGRAM JACK AT REAR OF UNIT SELECTS CHAMBER TEMPERATURE.

CAUTION: ALWAYS CONNECT SAFETY PLUG (AT REAR OF CHAMBER) WHEN AN EXTERNAL PROGRAMMER IS NOT BEING USED. (SEE PAGE 17)

SPECIFICATION SHEET

MK 6300 CHAMBER

TEST AREA DIMENSION: Bench - 12" x 20" x 16"
Rack - 20" x 12" x 16"

OUTSIDE CASE DIMENSION: Bench - 21-19/32" x 32-15/16" x 29-1/8"
Rack - 33-1/8" x 19" x 29-1/4"

AIR CIRCULATION: Two 140 CFM centrifugal blowers with baffling to provide equal distribution throughout the chamber in a vertical air flow pattern, and horizontal for the rack model.

INNER LINER: Type 302 Stainless Steel

OUTER CASE: Aluminum

EXTERNAL FINISH: Grey, pebble enamel

INSULATION: Fiberglas

WEIGHT: 127 lbs.

POWER REQUIREMENT: 1.740 KW, 120V, 60 cycle, single phase AC

CONTROLS: POWER ON-OFF switch and indicator light, COOL ON-OFF switch and indicator light, HALF-FULL POWER switch, HEAT ON-OFF switch and indicator light, Temperature Set Point control, local or remote control switch (Mode).

HEATING ELEMENTS: Four 8.75 ohm elements to give a total of 1640 watts.

COOLING: Liquid CO_2 metered injection (900 psi standard, 300 psi optional) or liquid nitrogen.

PROGRAMMING: Chamber requires no modification.

COOL DOWN TIME: 4-1/2 Minutes ambient to -65°F.

HEAT UP TIME: 24 Minutes ambient to 425°F.

TEMPERATURE RANGE: -100 to +600°F for LN_2 models.

RESETTABILITY: ± 0.25°F.

TEMPERATURE DEVIATION: ± 0.1°F.

LINE VOLTAGE STABILIZATION: ± 0.25°F for 105 to 125 VAC, 60 cycle line voltage change.

AMBIENT TEMPERATURE COMPENSATION: 0.010°F

HEAT LOAD COMPENSATION: 0.040°F/Watt

GRADIENT IN TEST AREA: (1-1/2" from walls in corners and in the center of the test area): 0.75°F/100°F difference, measured from ambient.

HEATING RATE: See

COOLING RATE:

CO_2 CONSUMPTION:

THERMAL IMPEDANCE OF CHAMBER: Approximately 0.75°F/Watt

NULL DETECTOR CONTACT CLOSURE: Temperature will be within 4°F of final temperature at 3 minutes after closure occurs. (425°F from ambient start).

NULL DETECTOR CONTACT RATING: 1 amp, 240 V, with contact protection provided by user to protect against inductive loads.

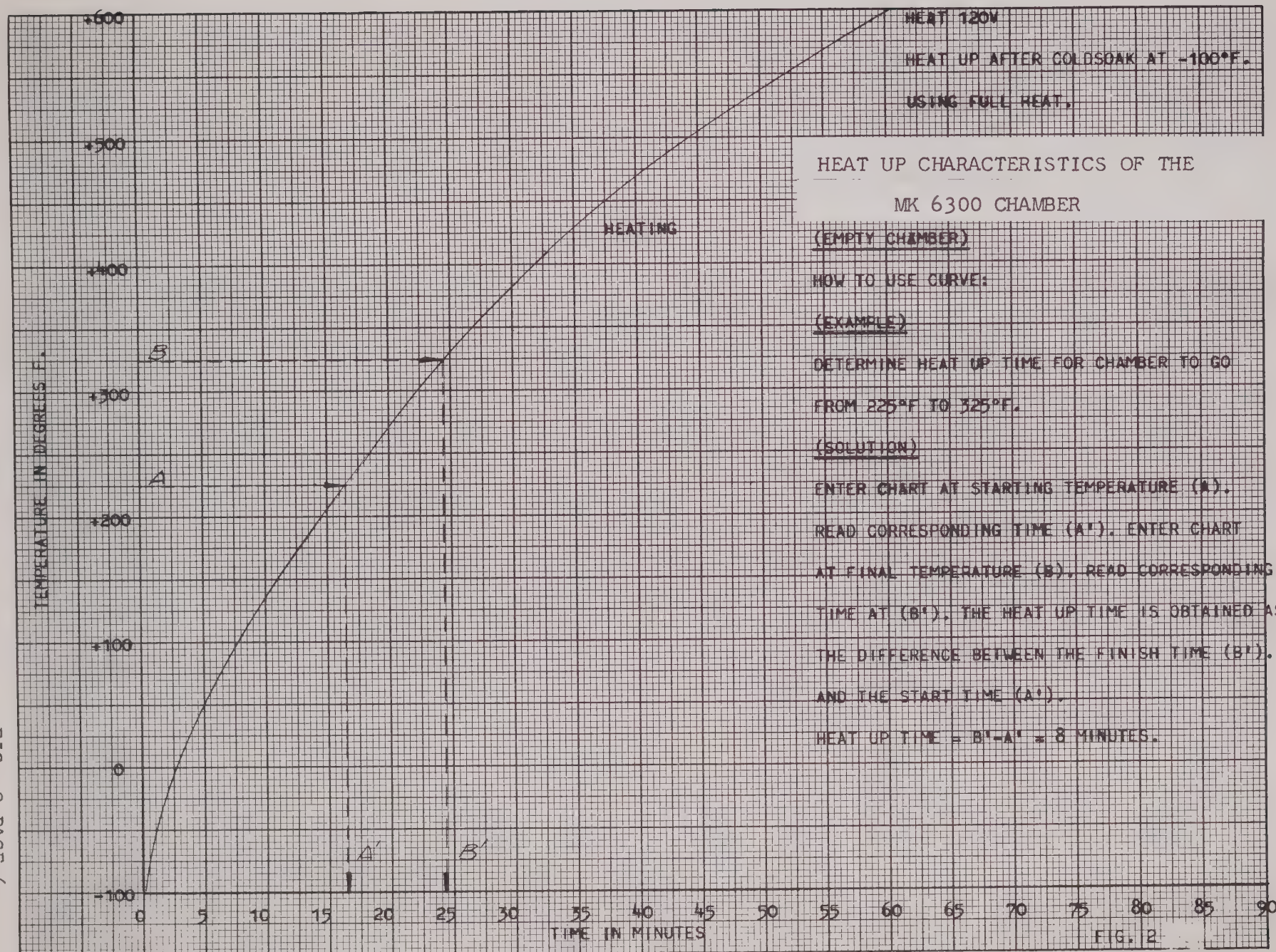


FIG. 2

FIG. 2 PAGE 6

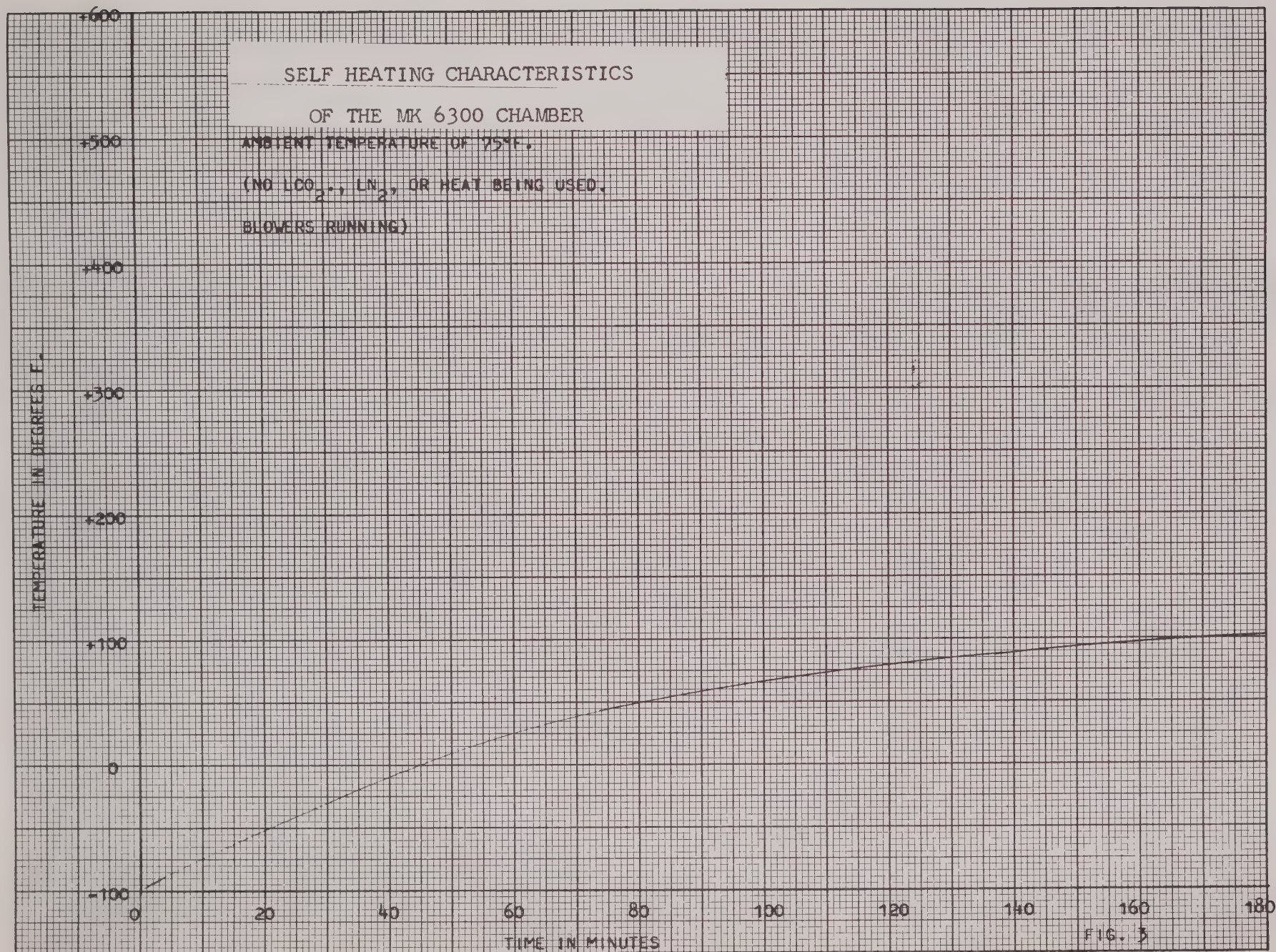

SELF HEATING CHARACTERISTICS
OF THE MK 6300 CHAMBER
AMBIENT TEMPERATURE OF 75°F.
(NO LCO_2., LN_2, OR HEAT BEING USED,
BLOWERS RUNNING)
TEMPERATURE IN DEGREES F.
+600
+500
+400
+300
+200
+100
0
-100
0
20
40
60
80
100
120
140
160
180
TIME IN MINUTES

FIG. 3

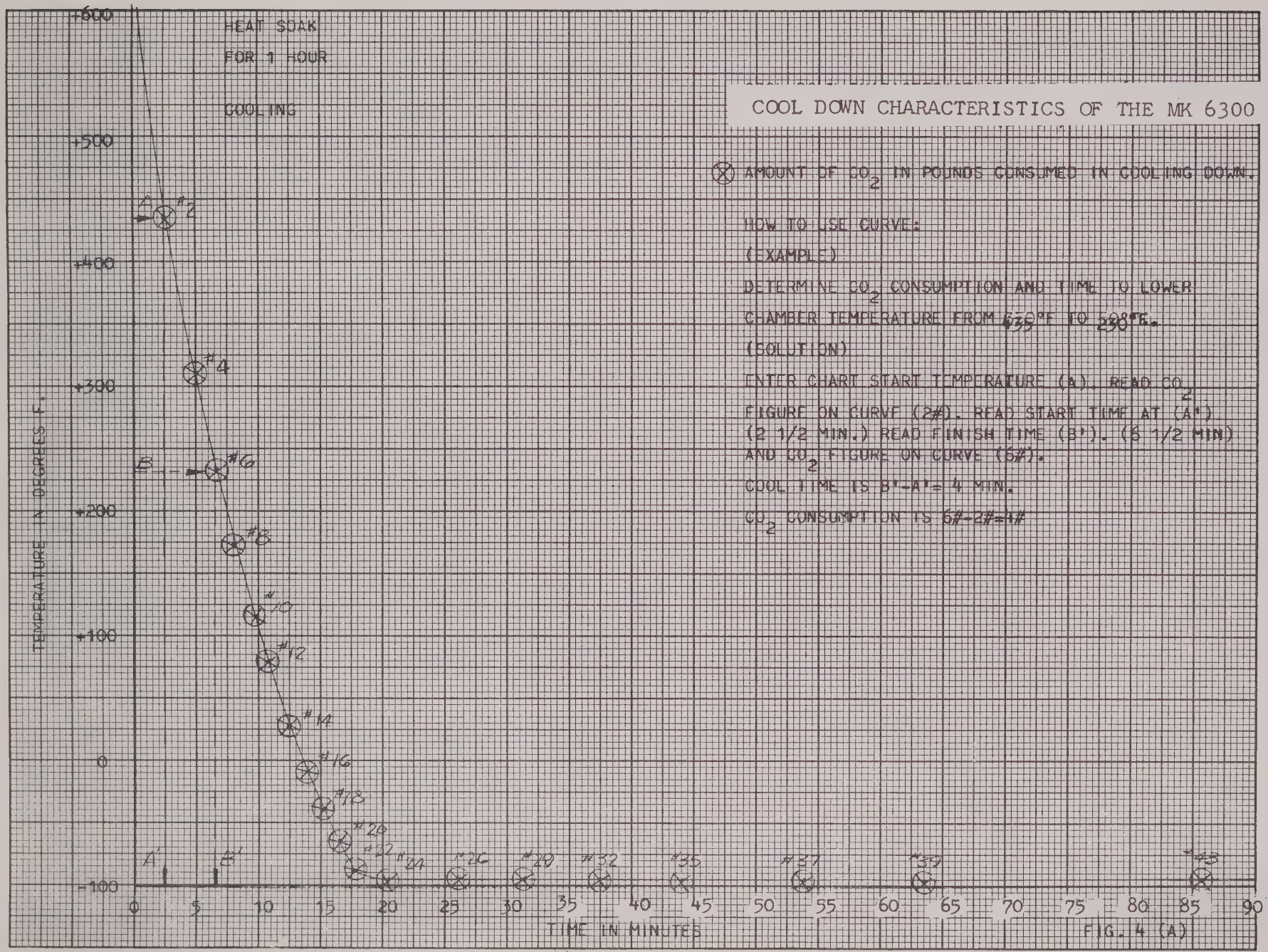


FIG. 4 (A)

FIG. 4A PAGE 8A

MADE IN U.S.A.
KEUFFEL & ESSER CO.

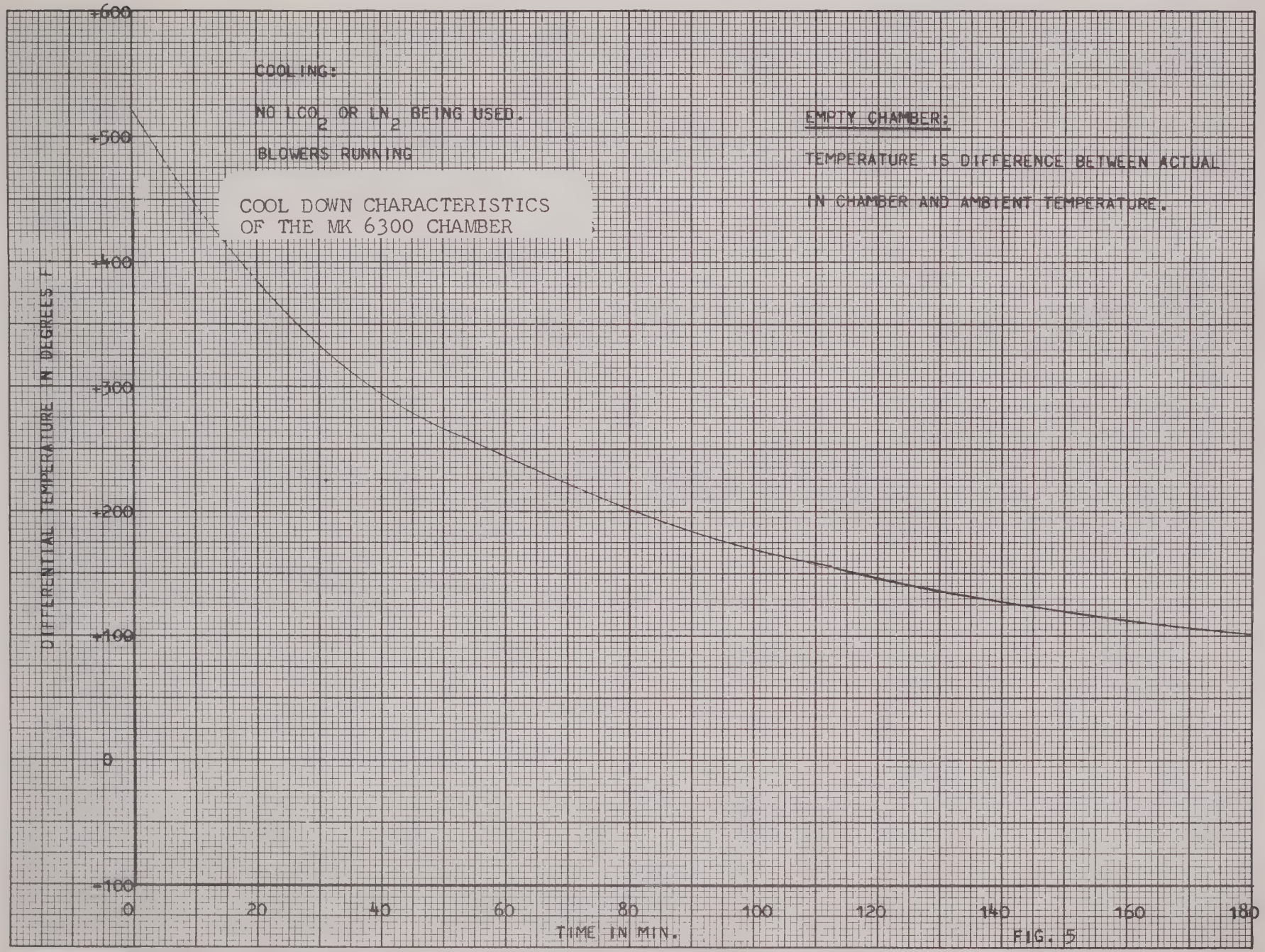


FIG. 5

KEUFFEL & ESSER CO.

(36)

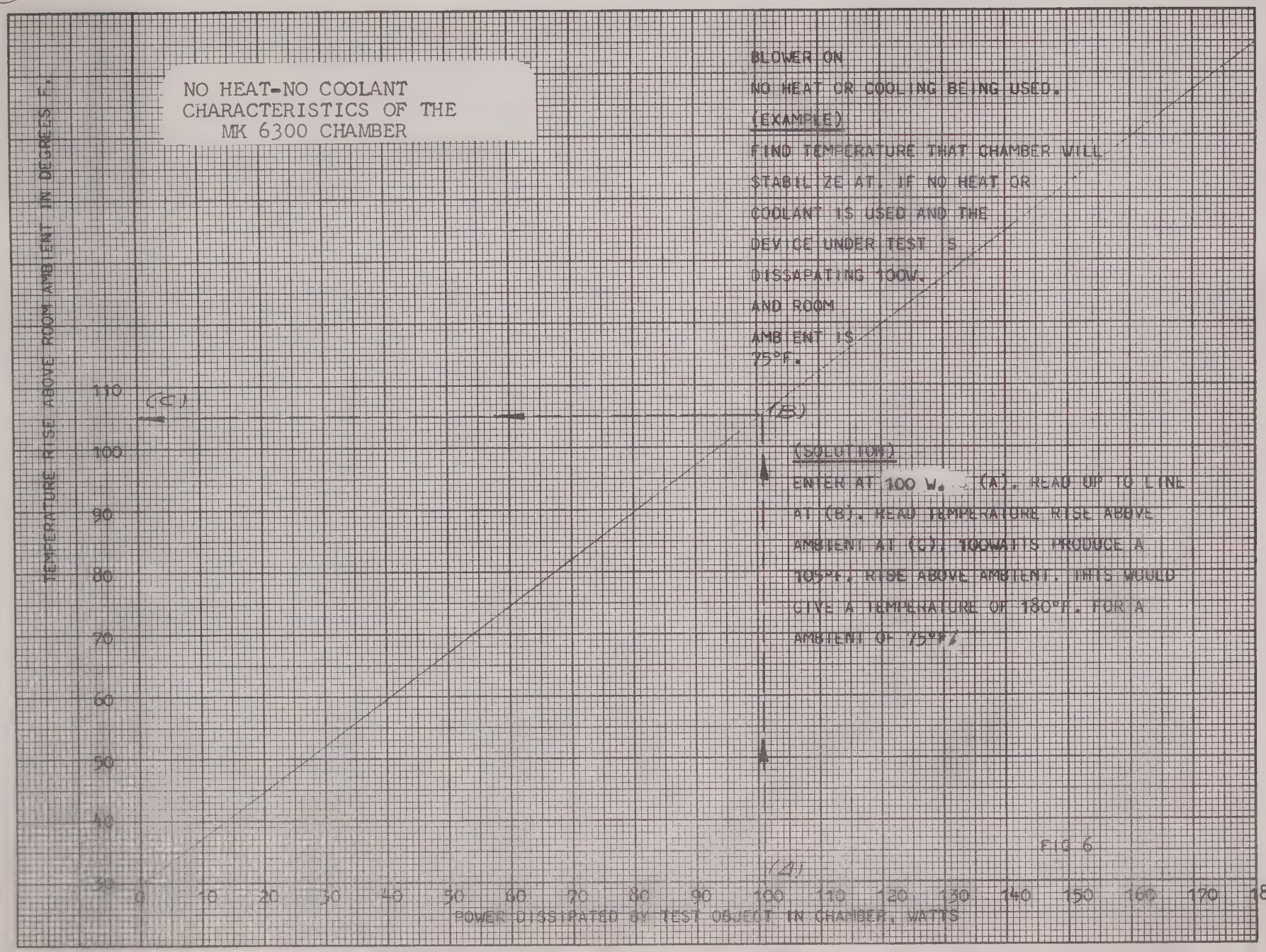


FIG 6

FIG. 6 PAGE 10

EXAMPLES OF DIAL INDICATION FOR VARIOUS TEMPERATURES:

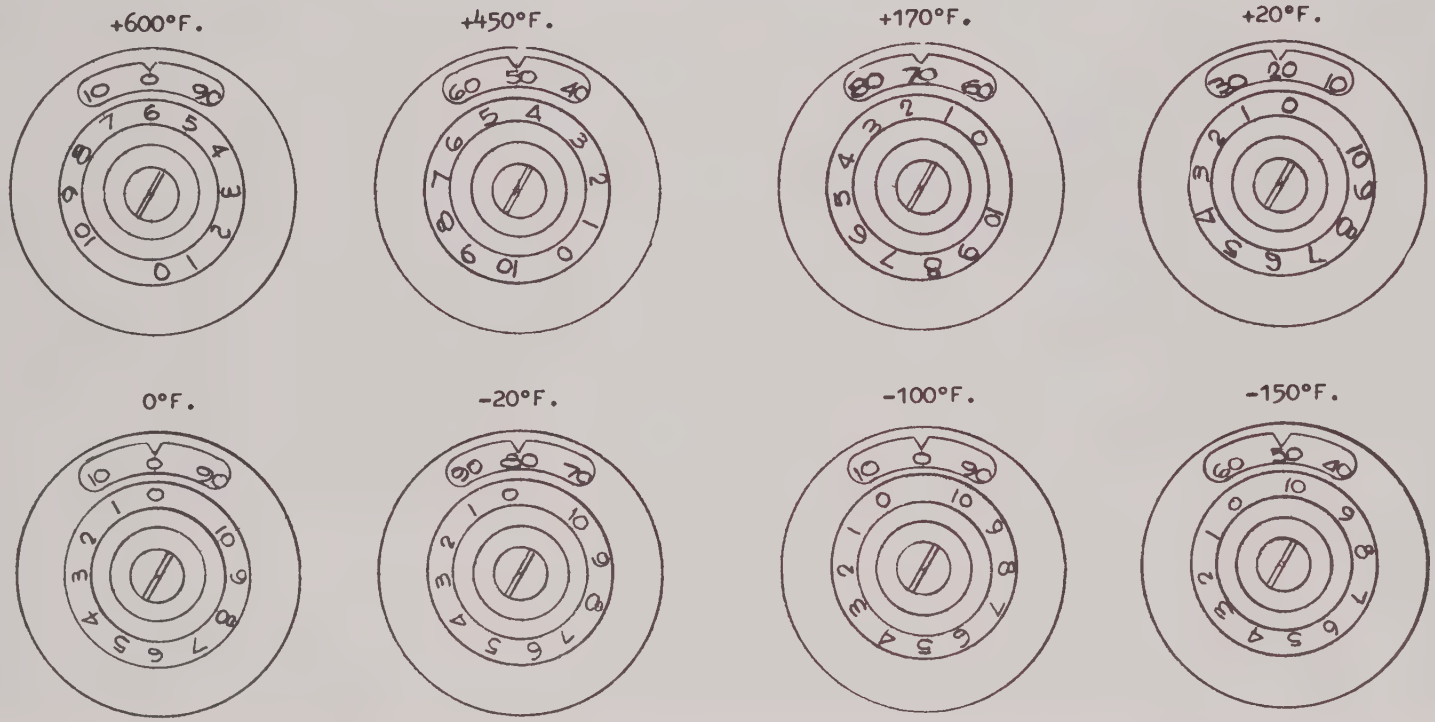


FIG. 7 PAGE 11

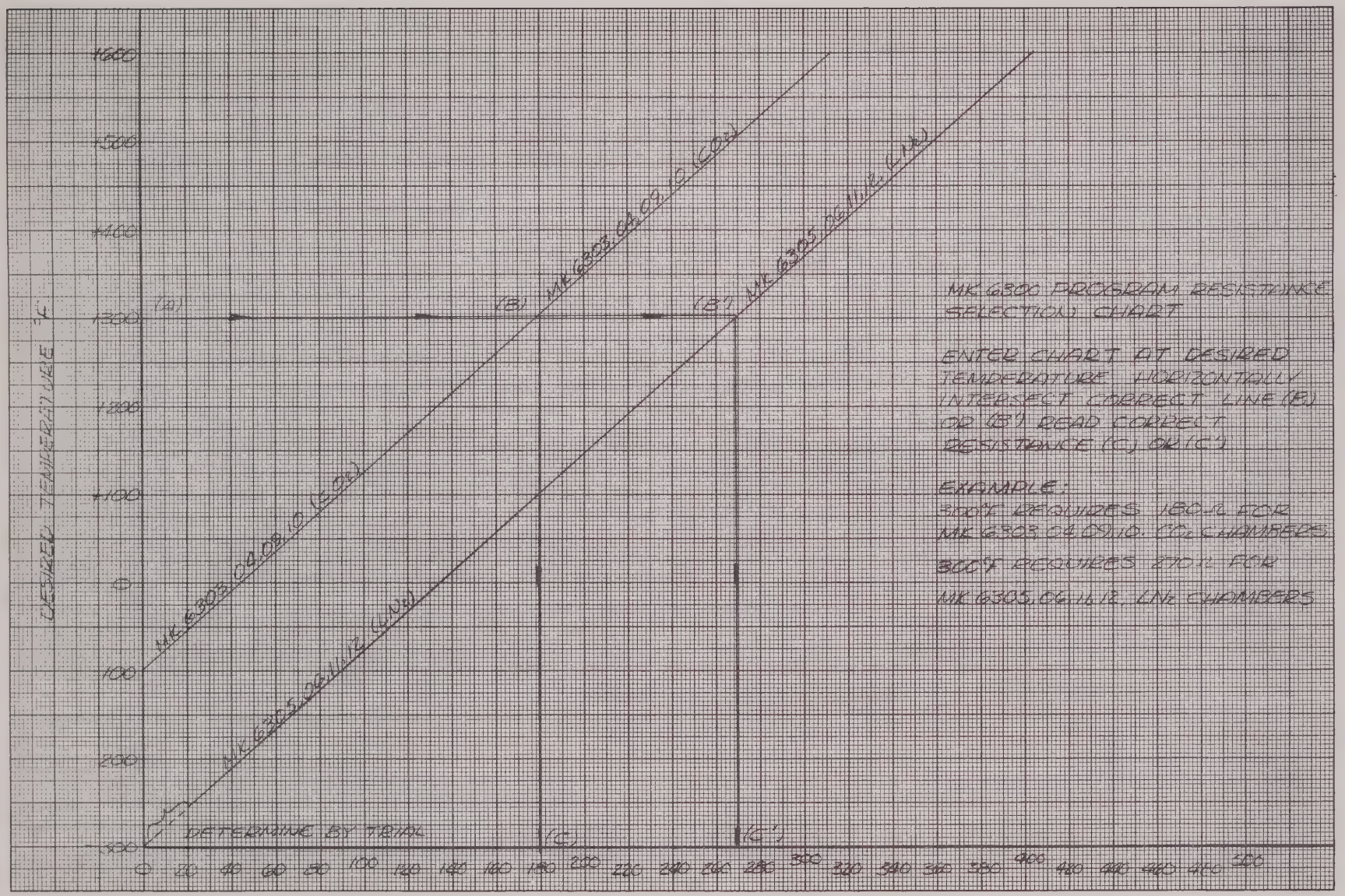
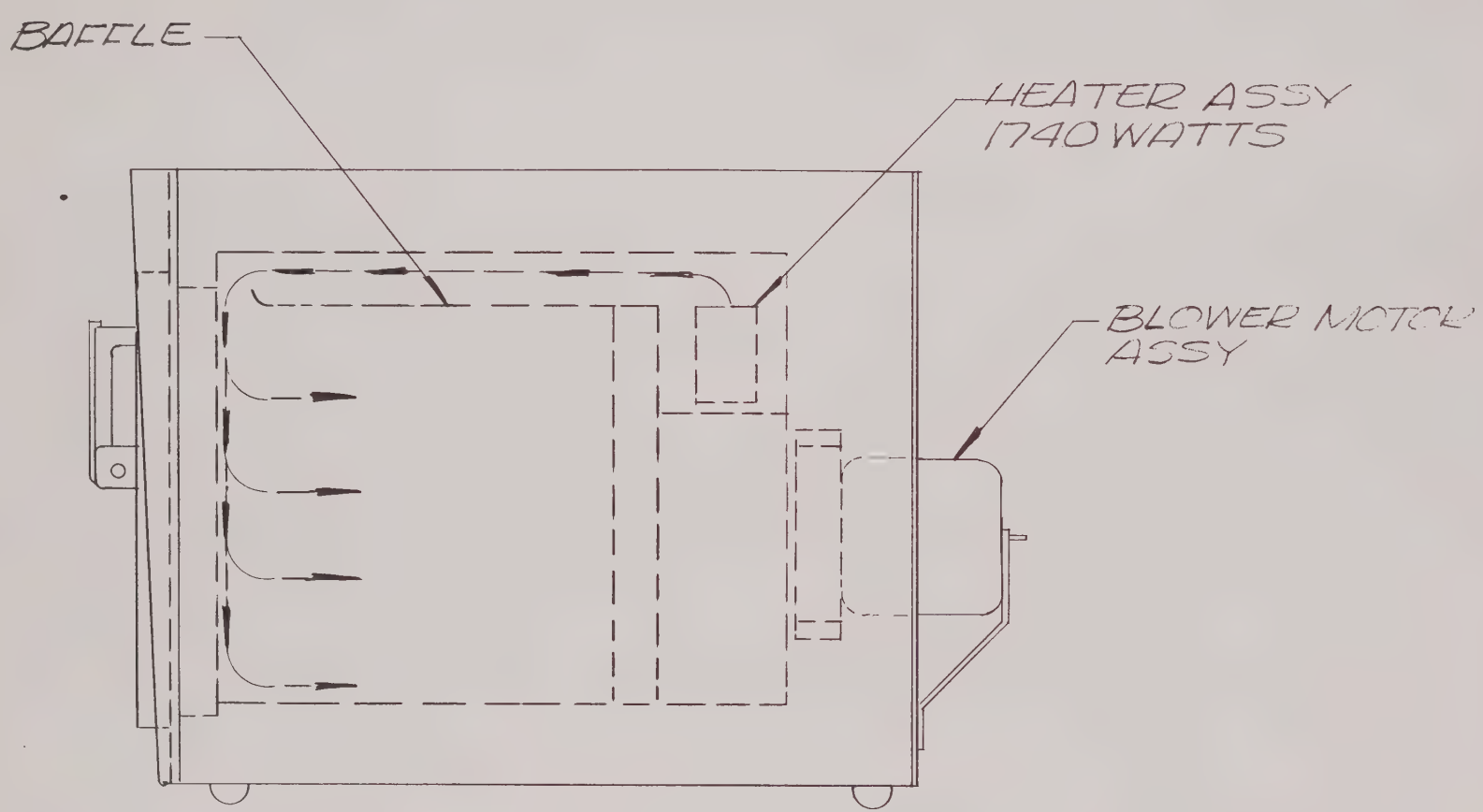
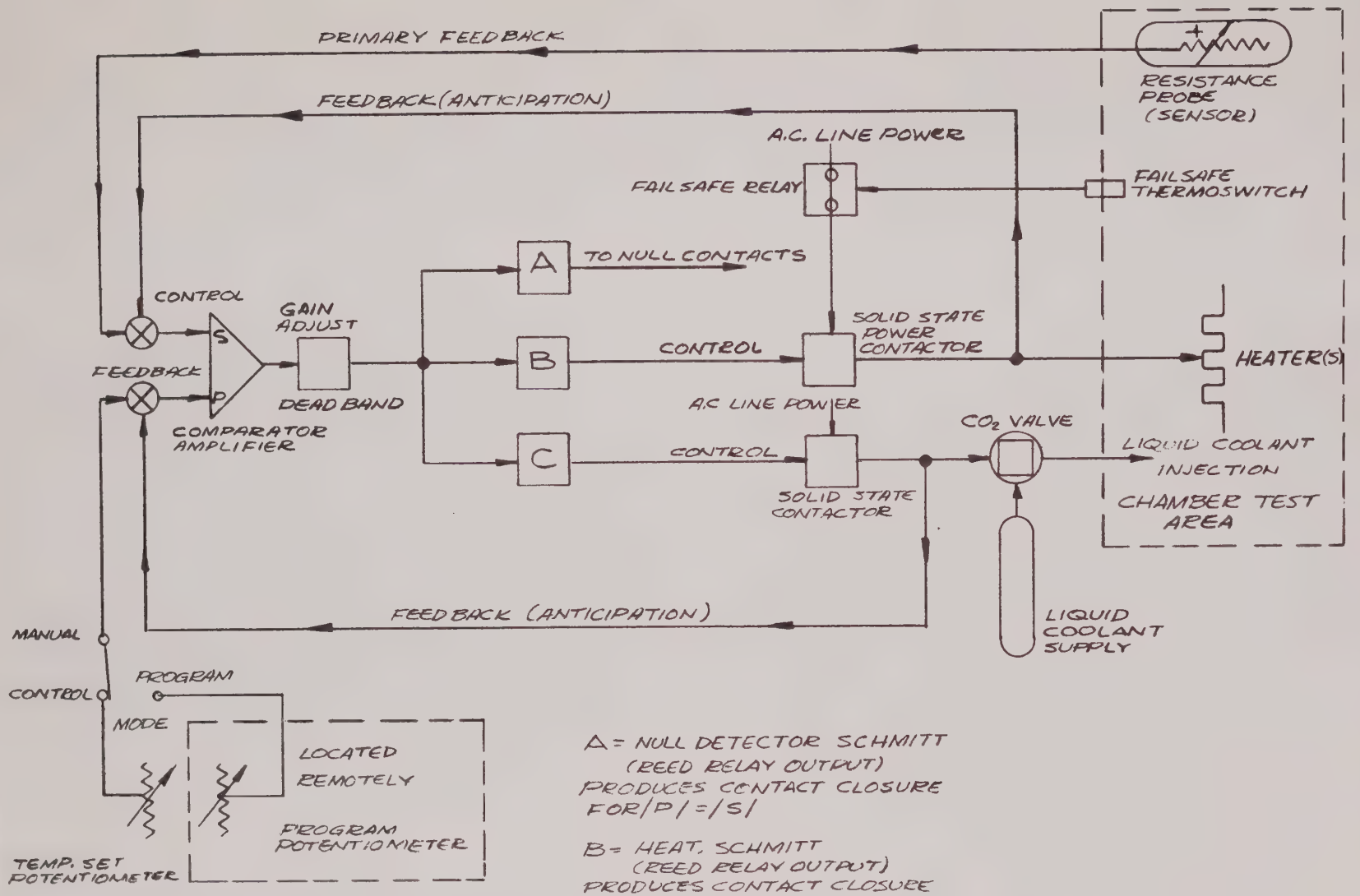

DESIRED TEMPERATURE °F
+600
+500
+400
+300
+200
+100
0
-100
-200
-300
(A)
(B)
(B')
MK 6303.04.09.10 (LOX)
MK 6305.06.11.12 (LN2)
DETERMINE BY TRIAL
(C)
(C')
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500
MK 6300 PROGRAM RESISTANCE SELECTION CHART
ENTER CHART AT DESIRED TEMPERATURE HORIZONTALLY INTERSECT CORRECT LINE (B) OR (B') READ CORRECT RESISTANCE (C) OR (C')
EXAMPLE:
300°F REQUIRES 160Ω FOR MK 6303.04.09.10 CO_2 CHAMBERS
300°F REQUIRES 270Ω FOR MK 6305.06.11.12 LN_2 CHAMBERS

FIG. 8 PAGE 12



MK 6300 CHAMBER AIR FLOW PATTERN

FIG. 9 PAGE 13



A = NULL DETECTOR SCHMITT
(REED RELAY OUTPUT)
PRODUCES CONTACT CLOSURE
FOR /P/ = /S/

B = HEAT, SCHMITT
(REED RELAY OUTPUT)
PRODUCES CONTACT CLOSURE
FOR /P/ INPUT AT AMPLIFIER
GREATER THAN /S/

C = COOL, SCHMITT
(REED RELAY OUTPUT)
PRODUCES CONTACT CLOSURE
FOR /S/ GREATER THAN /P/

TEMPERATURE CONTROL SYSTEM
SOLID STATE, TYPE III
DELTA DESIGN INC.
LA MESA, CALIF.

FIG. 10 PAGE 14

INSTALLATION

Rack mounting models may be used as bench mounted types if a 1/2 inch clearance is maintained underneath to allow the required air flow out the bottom of the chamber. This is necessary for proper controller cooling. The mounting feet on bench models maintain the required clearance. Do not operate the chamber without the required air space beneath it.

POWER CONNECTION

The circuit to which the chamber is to be connected should have a 20 ampere minimum rating. The outlet should be of the polarized type with a "U" grounding slot. Ensure that all switches are OFF and plug the chamber power cord into the outlet. Do not use the 3-wire to 2-wire adapter. Use the adapter only if the outlet is of the non grounding type. The short, green lead (terminating in a clip) should be fastened to the grounding screw securing the cover plate to the outlet. THE CHAMBER MUST BE PROPERLY GROUNDED.

LIQUID COOLANT

Liquid Carbon Dioxide - 900 psi system

Test the bottle by releasing a small amount of LCO_2 into a white handkerchief. Any brown stain indicates rust which would clog the filter and valve in the chamber. A wet handkerchief indicates water which would either freeze in the valve or clog the injector nozzle. Crack the LCO_2 valve open on the cylinder and notice the spray. It should be a dense, white cloud. It looks thin and gray when the tank is almost empty. An almost empty tank will not give proper cooling and should not be used. Connect the tank of LCO_2 to the rear of the chamber with the supplied high-pressure hose and fittings. Place a small amount of sealing compound on the threads of the male fitting to prevent leakage. DO NOT LET ANY SEALING COMPOUND GET INTO THE VALVE INLET ON THE REAR OF THE CHAMBER. Open the bottle and check for leaks which show as frosty spots on the hose or fittings.

Liquid Carbon Dioxide - 300 psi Low Pressure system

When the in-plant use of liquid CO_2 exceeds approximately 1000 to 2000 lb. per month, a bulk liquid storage system can be installed to reduce the cost of coolant. Chambers being operated with this type of system have to be fitted with a different CO_2 valve and injector than used on a 900 psi system. Changing a valve is described in Fig. 13. If new

chambers are ordered for use with a bulk storage 300 psi system, the fact should be stated on the order.

NOTE: The bulk storage system should be of the recirculating type if possible. If not, the supply should be located as close as possible to the chamber to minimize gas formation in the supply line. This is particularly important in low volume usage systems as the insulation and fluid flow are the factors that prevent boiling of CO_2 in the supply line. Gaseous CO_2 is not an effective coolant.

All lines, valves and connecting hoses should be blown out before the chamber is connected. Water is very troublesome and is apparently inherent in some low-pressure refrigerated supplies. If lines are opened to bleed off excessive pressure at shutdown, close them to prevent contamination by condensed moisture. This will help to keep ice from forming in the control valve.

LIQUID NITROGEN

Operation to temperatures as low as -300°F is possible with LN_2 as the coolant. The calibration of the TEMPERATURE SET Dial will be somewhat non linear at temperatures lower than -250°F. A temperature in the chamber of -300°F will be obtained with a dial setting of approximately -285°F.

CAUTION

Oxygen in the air surrounding the chamber inner liner and in the insulation can be liquified at temperatures at or below -297°F. This creates an oxygen rich atmosphere surrounding the heater area. The chamber tends to be self purging as the nitrogen replaces the usual atmosphere near the heaters. Any mixture of oil and liquid oxygen can be explosive so that extreme care must be used during operation at very low temperatures.

A 300 psi valve and stainless steel, polyurethane foam insulated, injector assembly is used for the liquid nitrogen applications. LCO_2 from a tank will not operate properly in a chamber equipped for LN_2.

Connect a liquid nitrogen liquid withdrawal container to the LN_2 input of the chamber with an insulated transfer line. A relief valve should be installed in the line with a relief pressure between 60 and 100 psi for a 2700 cu. ft. 50 psi liquid withdrawal container.

A motor DE-ICER switch, located on the chamber front panel is provided on LN_2 chambers. This switch turns on a heater on the chamber blower to melt any ice forming on the impeller blades during the cooling process.

Ice on the impeller causes vibration and noise. Addendum schematic 1185A-3 shows de-icer heaters and switch connections.

ADJUSTING THE FAIL SAFE

The Failsafe is adjusted by rotating the slotted FAILSAFE control. The trip temperature is increased by rotating the control counter-clockwise and is lowered by turning the control clockwise. One full turn changes the trip temperature approximately 90°F.

The two recommended procedures for setting the Failsafe are:

(1) Operate the chamber at a known temperature. Read the temperature indication on the thermometer and ensure that the heat switch is in the ON position. Turn the Failsafe adjustment clockwise to lower the setting until the Failsafe Lamp turns on. This establishes the setting of the Failsafe. Estimate the number of turns required of the Failsafe adjustment at 90°F per turn, and rotate the control counter-clockwise to the desired setting.

(2) Operate the chamber at the maximum temperature for the test and adjust the Failsafe control so that the Failsafe is on the verge of tripping.

NOTE: DO NOT ADJUST THE FAILSAFE MORE THAN 1 FULL TURN TOWARDS LOWER TEMPERATURES (CLOCKWISE ROTATION) AFTER THE FAILSAFE LIGHT COMES ON AS THE THERMO-SWITCH UNIT CAN BE DAMAGED BY FORCING.

READING THE TEMPERATURE SETTING OF THE DIAL INDICATOR - See Fig. 7

PROGRAMMING

Connect the correct resistances between pins 1 and 3 of the PROGRAM Jack. Set the MODE Switch to PROGRAM and the HEAT and COOL switches to their ON positions. The controller will apply heat or coolant as needed to obtain the programmed temperature.

A Safety plus is provided with the chamber and should be kept connected to the PROGRAM input whenever an actual programmer or actual resistance is not connected. The safety plug will prevent the chamber from accidently being programmed to a very high temperature if the MODE Switch is placed in the PROGRAM position with an open PROGRAM input.

The safety plug disables the heat and cool circuits of the controller when the MODE Switch is placed in the PROGRAM position.

MK 6300 CHAMBER & CONTROLLER DESCRIPTION

CHAMBER

The MK 6300 is a precision environmental temperature test chamber having a stainless steel interior, aluminum outer case and fiberglass insulation. The air circulation is closed and provided by a 140 CFM blower. (See Fig. 9) The chamber is heated by applying full wave power to a pair of bobbin wound nichrome 16 40 watt heating elements via the heat solid state switch.

The chamber is cooled by injecting liquid CO_2 (liquid nitrogen in the LN_2 models) into the air stream through an expansion nozzle. The coolant flow is metered by a solenoid valve, controlled by the cool solid state switch.

The temperature control system is shown in block diagram form as Fig. 10.

SOLID STATE CONTROLLER

The controller compares the resistance of the temperature probe to the resistance of the TEMPERATURE SET Potentiometer. (The resistance of a remote programming resistor is compared to the probe resistance if the MODE Switch is in the PROGRAM Position.)

The resistance of the probe will always be either less than, equal to, or greater than the resistance of the TEMPERATURE SET Potentiometer (program resistance). These three situations directly correspond to the chamber temperature being lower than, equal to, or higher than desired. The controller applies heat, coolant, or withholds both to obtain and maintain the selected temperature in the chamber.

NOTICE, the controller is a three mode unit, i.e.

(a) Heat only
(b) No heat or coolant
(c) Coolant only

This mode of control ensures that LCO_2 or LN_2 is not wasted in a continuous cycling of the heaters and coolant valve such as would be the case for a simple two state output controller.

NULL DETECTOR CIRCUIT

A contact closure is provided at the rear when the chamber reaches the indicated SET Point of the controller. This contact closure may be used to signal that the chamber has reached selected temperature.

The Delta Design Model 9307 HI-LO Step Programmer, Model 9311 TEN STEP Programmer, and the Model 9312 HI-LO-AMBIENT Programmer utilize the null contacts to start their timers when they are used with the MK6300 chamber. This contact closure feature is most useful in automatic test programming applications.

ROUTINE MAINTENANCE

Oil main blower motor with Dumore 50-010 Spindle Oil every six months. Oil every month if the chamber is operated continuously. Place 6 drops of oil in each of the oiler tubes on the motor.

CONTROLLER CALIBRATION PROCEDURE - A periodic calibration of the controller is normally not required.

The required equipment to calibrate the controller will be an oscilliscope and a precision resistor substitution box such as a General Radio Co. type 1432-T.

PREPARATION

(a) Remove the controller module from the chamber or remove the side of the chamber to expose the controller.

(b) Remove the probe input leads to the controller. These are terminals 1 and 2 of TB 1 on the rear of the controller. These are the two top terminals on the left hand board looking at the rear of the unit from the back. Notice which wire goes to which terminal so that they can be put back as originally connected. Connect the resistance box between these two terminals on the rear of the controller.

(c) Connect an oscilliscope to the point shown on the Printed Circuit Board Assembly drawing which is number 1137C-3, sht. 2 of 2. Connect the ground of the scope to any portion of the controller frame.

(d) Plug the chamber power cord into a source of power, turn the heat and cool switches OFF and the Power switch ON.

(e) Ensure that the MODE Switch is in the MANUAL Position.

(f) Verify that the TEMPERATURE SET DIAL rotates freely and at the counterclockwise stop indicates -100°F (-73°C). (-300°F or -184°C for LN_2 models.)

(g) The location of the SLOPE and OFFSET potentiometers is shown in Fig. 11. Adjust the SLOPE (100 ohm) and the OFFSET (20 ohm) trimpots to the center of their range (10 turns from either end).

CALIBRATION

(a) Rotate the TEMPERATURE SET DIAL to 600°F and select 427.24 ohms on the resistance box. Adjust the SLOPE trimpot until a null occurs on the scope.

(b) Rotate the TEMPERATURE SET DIAL to 100°F and set the resistance box to 209.99 ohms. Adjust the OFFSET trimpot until a null occurs on the scope.

Note: The LOWER temperature adjustment is made on the LOWER RESISTANCE (20 ohms) and the HIGHEST temperature adjustment is made on the HIGHEST RESISTANCE (100 ohm) trimpot. Alternately adjust the 600 and 100 points until the dial is correct at both temperatures.

Turn off and disconnect power, remove the test equipment and reconnect the probe wires to the rear of the controller.

TROUBLE SHOOTING - See Fig. 12

The following factors aid the trouble shooting procedures greatly. (1) The red Heat lamp is connected across the controller heat output. A brightly glowing RED lamp is an indication that the heaters are being energized. (2) The green Cool lamp is connected directly across the coolant valve solenoid and when glowing brightly, indicates power applied to the solenoid. (3) Turning the MODE Switch to PROGRAM, with the safety plug connected, should extinguish both the Heat and Cool lamps.

The waveforms and DC voltages are shown on the Printed Circuit Assembly Schematic, Drawing Number 1137D-3, sht. 1 of 2 and should be checked for difficult cases.

SOLENOID VALVE REPLACEMENT - See Fig. 13

HEATER ASSEMBLY REPLACEMENT - See Fig. 13

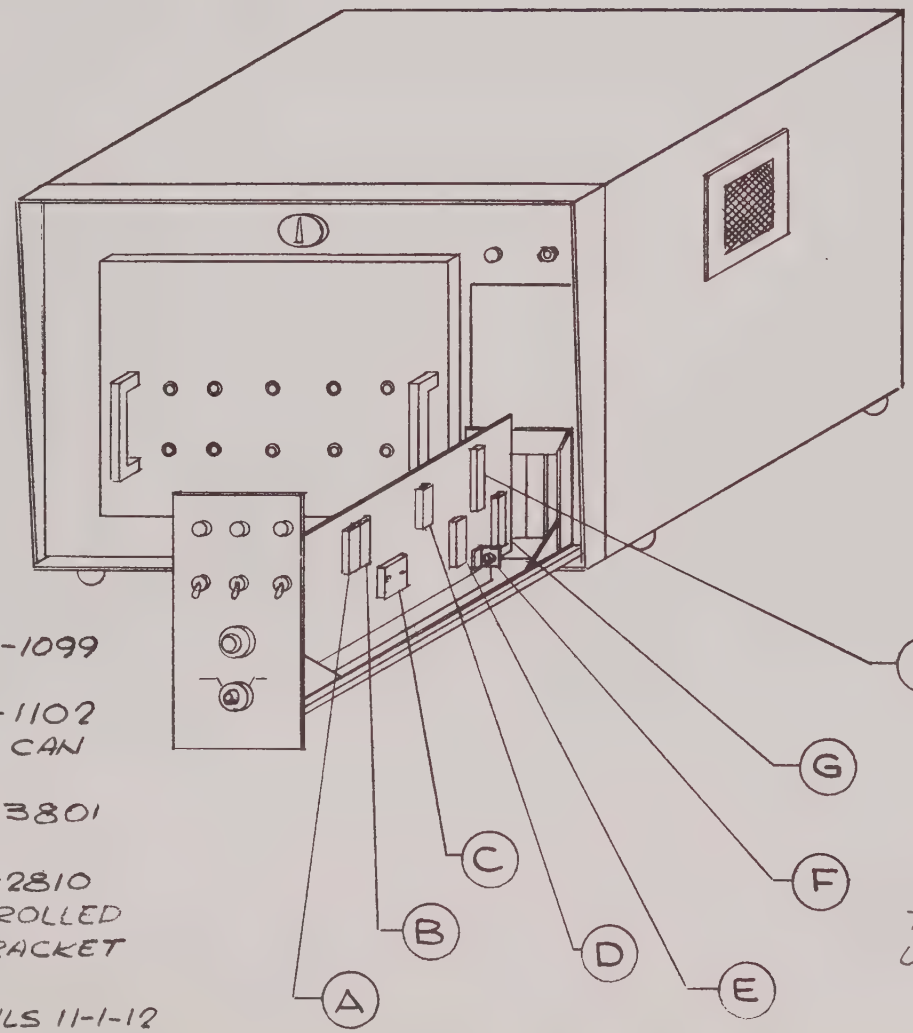
BLOWER MOTOR REPLACEMENT - See Fig. 13

TEMPERATURE PROBE REPLACEMENT- See Fig. 13

ORDERING REPLACEMENT PARTS

Please include the chamber model number, serial number and the part number as listed in the parts list.

A complete parts list is included as part of this manual.



A. TEMP. OFFSET
200P-1-200, A-1099
B. SLOPE ADJ.
200P-1-101, A-1102
C. ANTICIPATOR CAN
D. GAIN POT.
275-1-501 C-3801
E. REED RELAY
NLS 11-1-12, C-2810
F. SILICON CONTROLLED RECTIFIER & BRACKET
C-22B, A1104
G. REED RELAY, NLS 11-1-12
H. REED RELAY, NLS 11-1-12

TYPE III CONTROLLER USED IN MK 6300

FIG. 11 PAGE 22

1. TURN MODE SWITCH TO MANUAL.
2. NOTE THERMOMETER READING (CHAMBER TEMPERATURE)

TROUBLE SHOOTING CHART

HOW TO USE THIS CHART

3. TURN HEAT & COOL SWITCHES ON.
4. TURN TEMPERATURE SET CONTROL 50° HIGHER THAN CHAMBER TEMP. & NOTE THE CONDITIONS OF THE HEAT & COOL LAMPS.
5. TURN TEMPERATURE SET CONTROL 50° LOWER THAN CHAMBER TEMP. & NOTE THE CONDITIONS OF THE HEAT & COOL LAMPS.
6. ENTER THE CHART AT THE TOP FOR THE CONDITIONS OBSERVED IN STEP 4. (50° HIGHER THAN CHAMBER TEMPERATURE.
1. ENTER THE CHART AT THE LEFT SIDE FOR THE CONDITIONS OBSERVED IN STED 5. (50° LOWER THAN CHAMBER TEMPERATURE.)

THESE TWO SITUATIONS DETERMINE THE CORRECT BLOCK TO READ IN THE CHART.

LIGHT STATE WITH TEMPERATURE SET DIAL 50° HIGHER THAN CHAMBER TEMP.

LIGHT STATE WITH TEMPERATURE SET DIAL 50° LOWER THAN CHAMBER TEMP.

	RED – OFF GREEN – OFF	RED – ON GREEN – OFF	RED – OFF GREEN – ON	RED – ON GREEN – ON
RED – OFF GREEN – OFF	PROBE ELEMENT SHORTED TO CASE. (REPLACE) FAILURE ON AMPLIFIER P.C. BOARD. (TRACE SIGNAL WITH SCOPE) GAIN POT. SETTING TOO LOW. XFORMER WINDING OPEN FUSE ON CONT. CHASSIS BLOWN	COOL CIRCUIT HAS FAILED. TRACE SIGNALS WITH SCOPE.		
RED – ON GREEN – OFF		PROBE SHORTED OUT. TEMP. SET POT. – OPEN COOL ANTICIPATOR WINDING OPEN. CHECK BETWEEN TERMINAL A & CASE OF Q8 FOR ≈ 12Ω		
RED – OFF GREEN – ON	FAILSAFE RELAY K1 NOT ENERGIZING. COIL RESISTANCE WILL BE APPROX. 10K. DIODE BRIDGE FAILURE. CHECK CR19 – CR22 ON P.C. BOARD	NORMAL	PROBE OPEN TEMP. SET POT. SHORTED HEAT ANTICIPATOR WINDING OPEN: CHECK BETWEEN B & CASE OF Q9 FOR ≈ 12Ω	COOL CIRCUIT HAS FAILED – TRACE SIGNAL WITH SCOPE.
RED – ON GREEN – ON		HEAT CIRCUIT HAS FAILED – TRACE SIGNAL WITH SCOPE.		

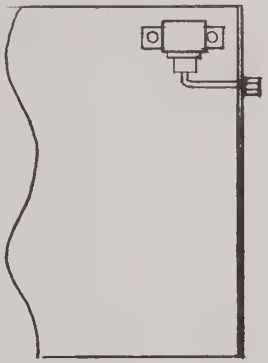
37

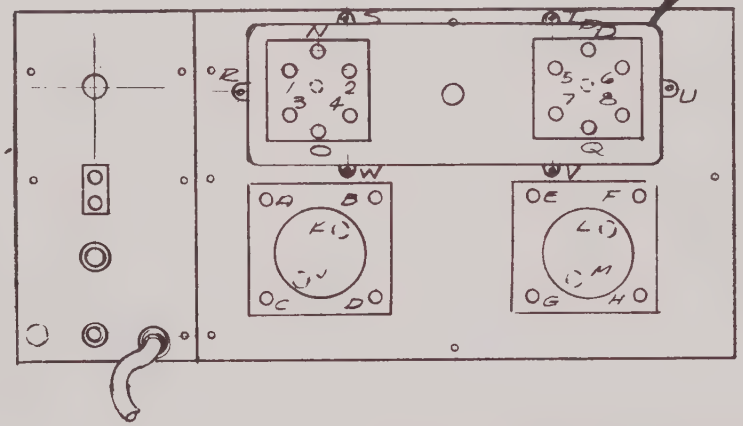
TO REMOVE CO_2 VALVE

1. UNPLUG CHAMBER POWER CORD.
2. REMOVE SCREWS FROM RIGHT SIDE COVER & SMALL REAR COVER.
3. PLACE RIGHT SIDE COVER ON TOP OF CHAMBER.
4. UNSCREW WIRE NUTS.
5. UNFASTEN PLASTIC TIE DOWN FROM CO_2 INJECTOR, REMOVE SCREWS, TAKE OUT CO_2 VALVE.

TO REMOVE HEATER

1. UNPLUG CHAMBER POWER CORD.
2. REMOVE & LAY ASIDE LARGE REAR COVER.
3. UNPACK FIBERGLAS TO EXPOSE HEATERS.
4. REMOVE WIRES FROM 1,2,3,4 & 5,6,7,8
5. TAKE OUT SCREWS (N,O) OR (P,Q)
6. PULL OUT HEATER ASSY





TO REMOVE LN_2 PACKAGE

UNPLUG CHAMBER POWER CORD.
REMOVE SCREWS R.S.T.U.V.W.
PULL PACKAGE STRAIGHT OUT TO AVOID DAMAGE TO LN_2 INJECTOR ASSY.
REMOVE WIRE NUTS.

TO REMOVE BLOWER MOTORS.

1. UNPLUG CHAMBER POWER CORD.
2. DO NOT REMOVE REAR COVER.
3. REMOVE 4 SCREWS & LAY GRILL ASIDE.
4. REMOVE WIRENUTS.
5. REMOVE (2) SCREWS (J,K) & (L,M)
6. PULL MOTOR DIRECTLY TO REAR

FIG. 13 PAGE 214

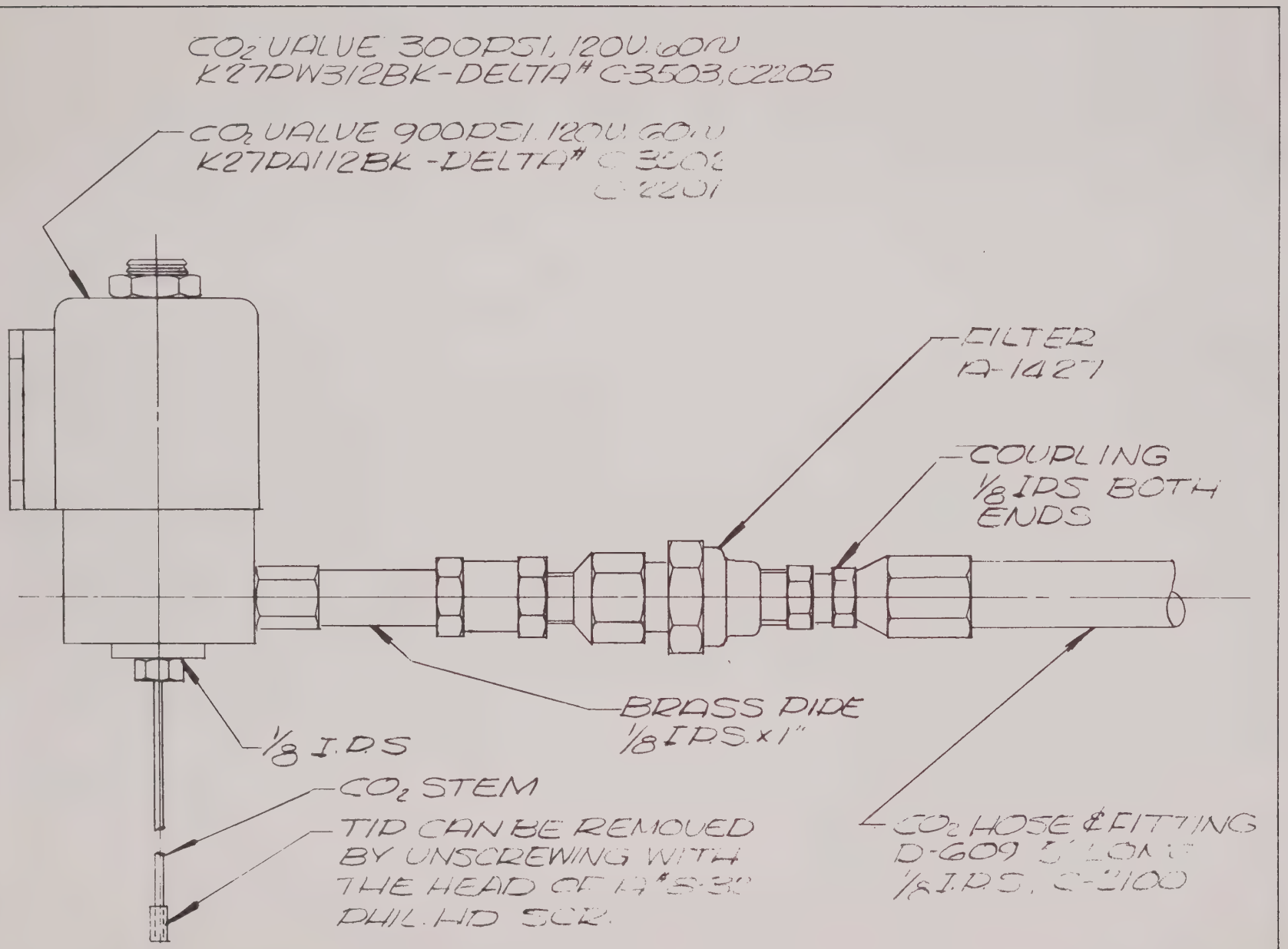


FIG. 14 PAGE 25

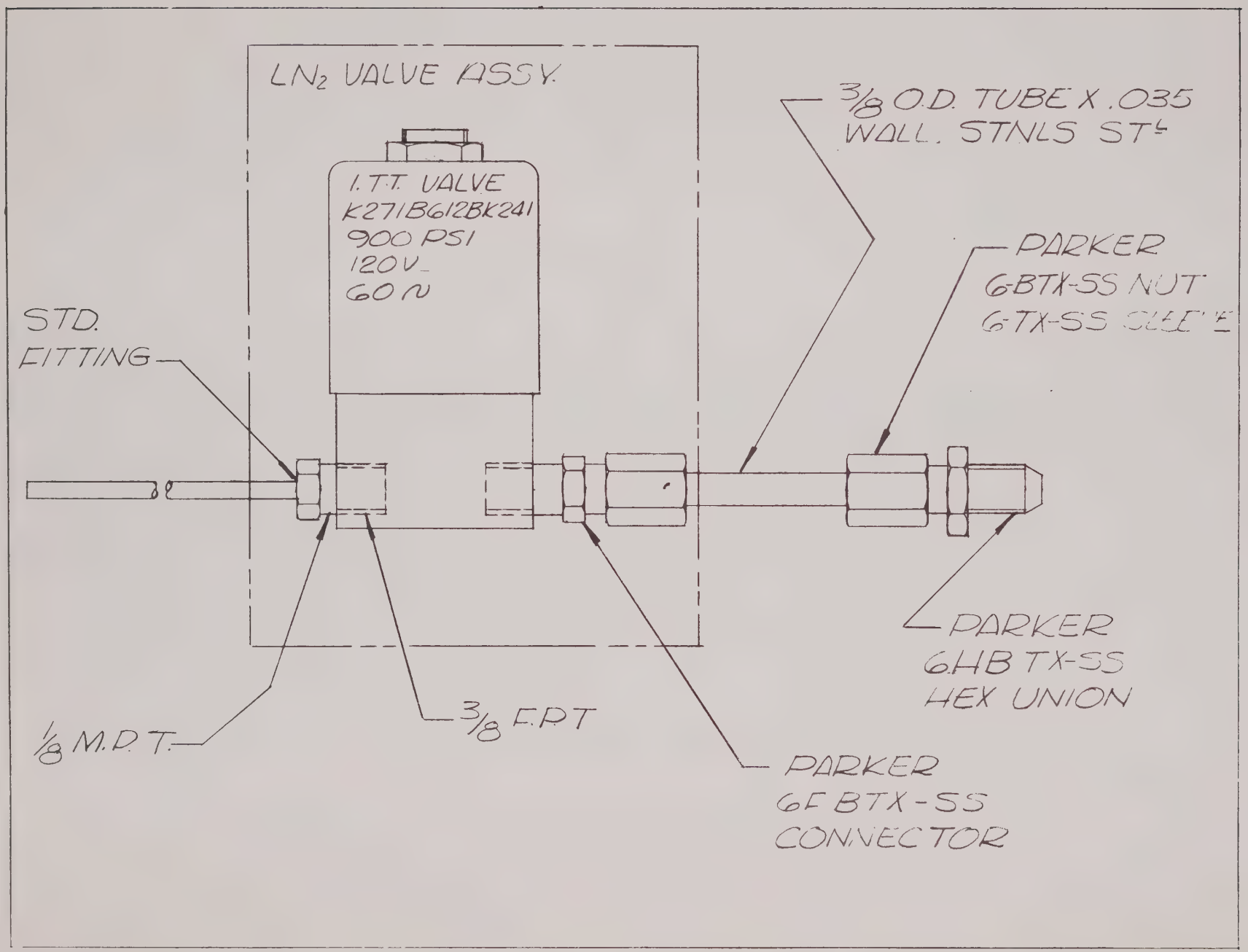
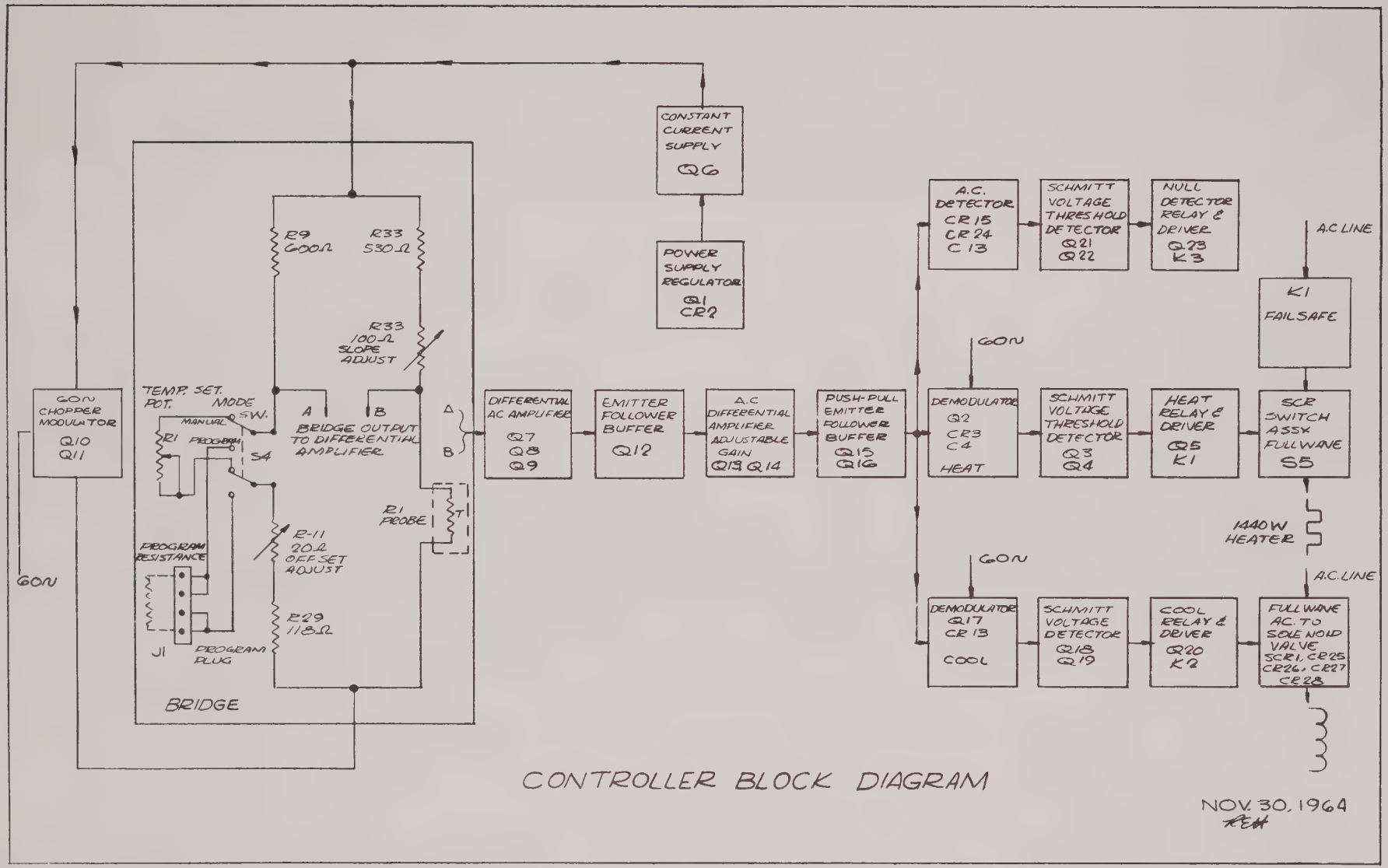
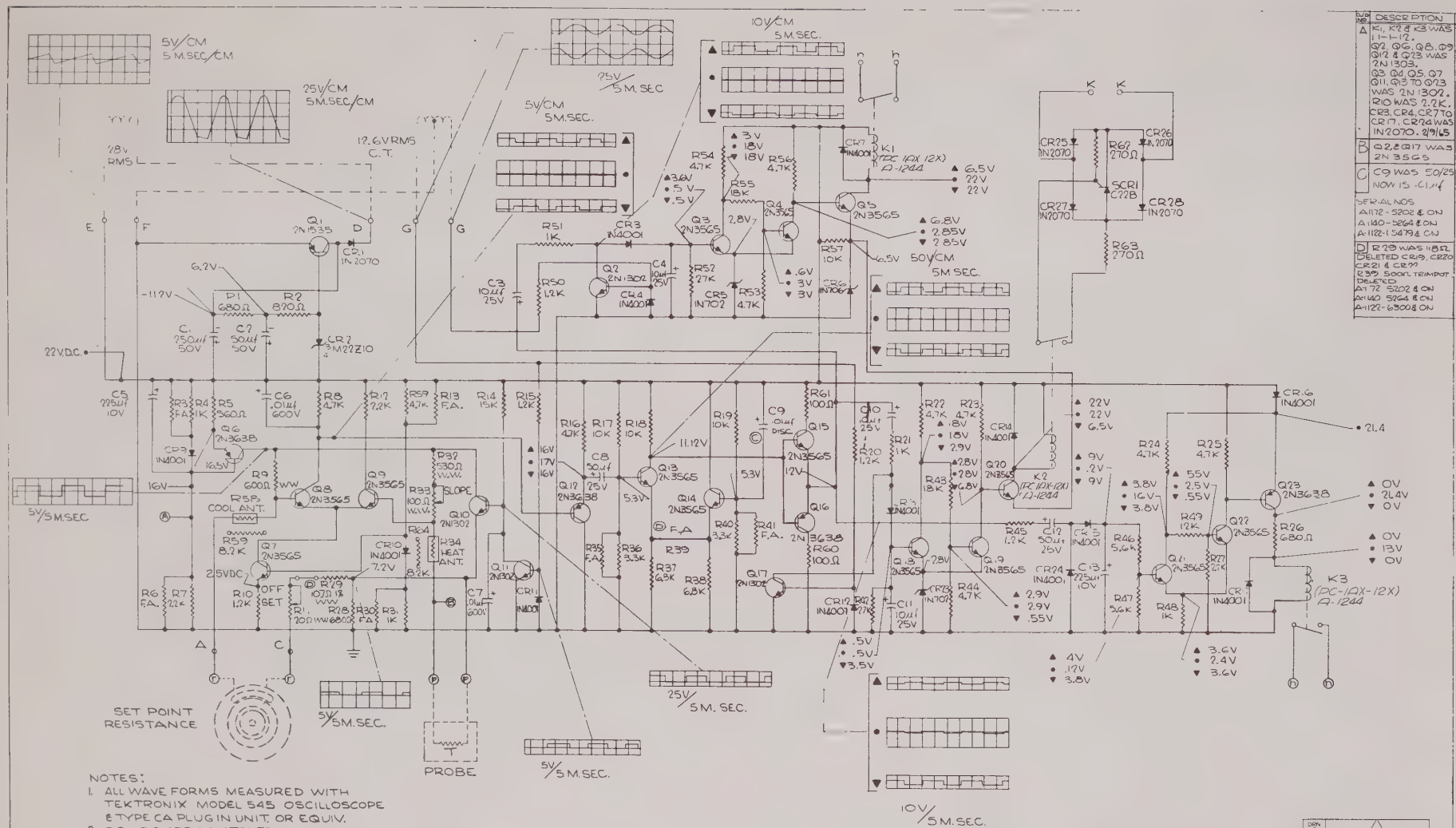


FIG. 15 PAGE 26



CONTROLLER BLOCK DIAGRAM

NOV. 30, 1964
REH



REV NO	DESCRIPTION
A	K1, K2 & K3 WAS 1-1-12. Q2, Q6, Q8, Q9, Q12 & Q23 WAS 2N1303. Q3, Q4, Q5, Q7, Q11, Q13 TO Q23 WAS 2N1302. R10 WAS 2.2K. CR3, CR4, CR7 TO CR17, CR24 WAS IN2070. 2/9/65
B	Q2, Q6, Q17 WAS 2N3565
C	C9 WAS 50/25 NOW IS .01/f
	SERIAL NOS A-1172 - 5202 & ON A-1140 - 5264 & ON A-1122-1 5479 & ON
D	R29 WAS 1182 DELETED CR19, CR20 CR21 & CR22 R39 500Ω TRIMPOT DELETED A-1172 5202 & ON A-1140 5264 & ON A-1122-1 6300 & ON

NOTES:
1. ALL WAVE FORMS MEASURED WITH TEKTRONIX MODEL 545 OSCILLOSCOPE & TYPE CA PLUG IN UNIT OR EQUIV.
2. Q8 & Q9 ARE A MATCHED PAIR
3. Q13 & Q14 ARE A MATCHED PAIR
4. ▲ SET POINT CONTROL, 10°F HIGHER THAN NULL
5. • SET POINT CONTROL, SET AT NULL
6. ▼ SET POINT CONTROL, 10°F LOWER THAN NULL
7. ALL VOLTAGES ARE D.C. & MEASURED FROM CHASSIS GROUND WITH 20K Ω/V METER

SCHEMATIC TYPE III PRINTED CIRCUIT BOARD ASSY.
DELTA DESIGN INC. PART NO A-1098

SERIAL Nº 5223 & ON

SHT: 1 OF 2

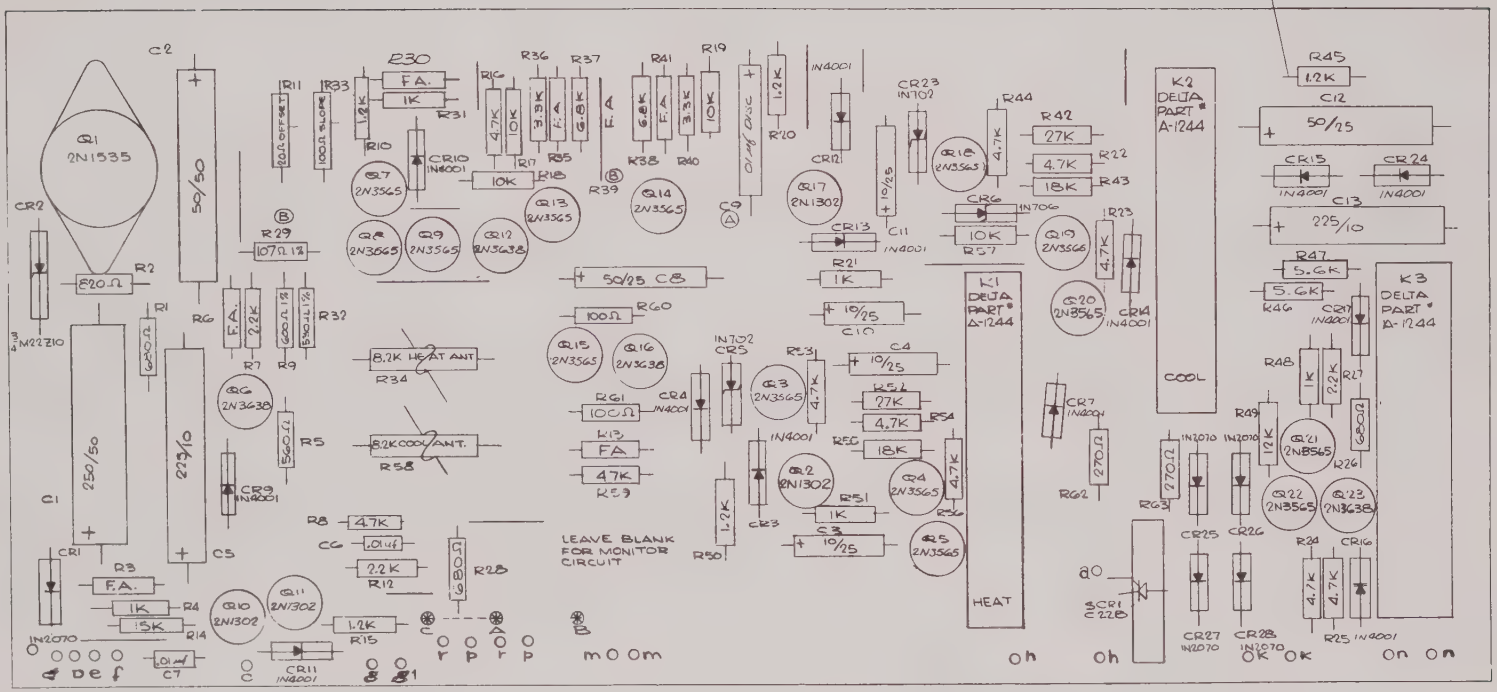
DRN RLH
APP GJL
DATE 4/14/65
NEXT ASSY
TITLE SCHEMATIC TYPE III PRINTED CIRCUIT BOARD ASSY
DWG NO 11370-3

DELTA DESIGN

FIG. 17 PAGE 28

A	C9 WAS 50/25	NOW IS .01μf DISC
	SERIAL NOS	A1172 - 5202 & ON A-1140 - 5264 & ON A-1122-1 - 5479 & ON
B	R29 WAS 118Ω CR19, 20, 21 & 22 DELETED TERMINALS C, C, C, C DELETED R39, 500Ω TRIMPOT DELETED	A-1172 - 5202 & ON A-1140 - 5264 & ON A-1122 - 6300 & ON

ATTACH SCOPE HERE TO MONITOR NULL WHEN CALIBRATING. (CONNECT SCOPE GND TO CHASSIS GROUND)



GLUE FOUR FIBER WASHERS ON P.C. BOARD FOR STANDOFFS

PARTS LAYOUT, PRINTED CIRCUIT BOARD ASSY.
DELTA DESIGN INC. PART NO. A-1098

SERIAL NO 5223 & ON SHT: 2 OF 2

3/26/64 DRN
4/27/64
PARTS LAYOUT P.C. BOARD ASSY. A-1098
1137C-3

FIG. 18 PAGE 29

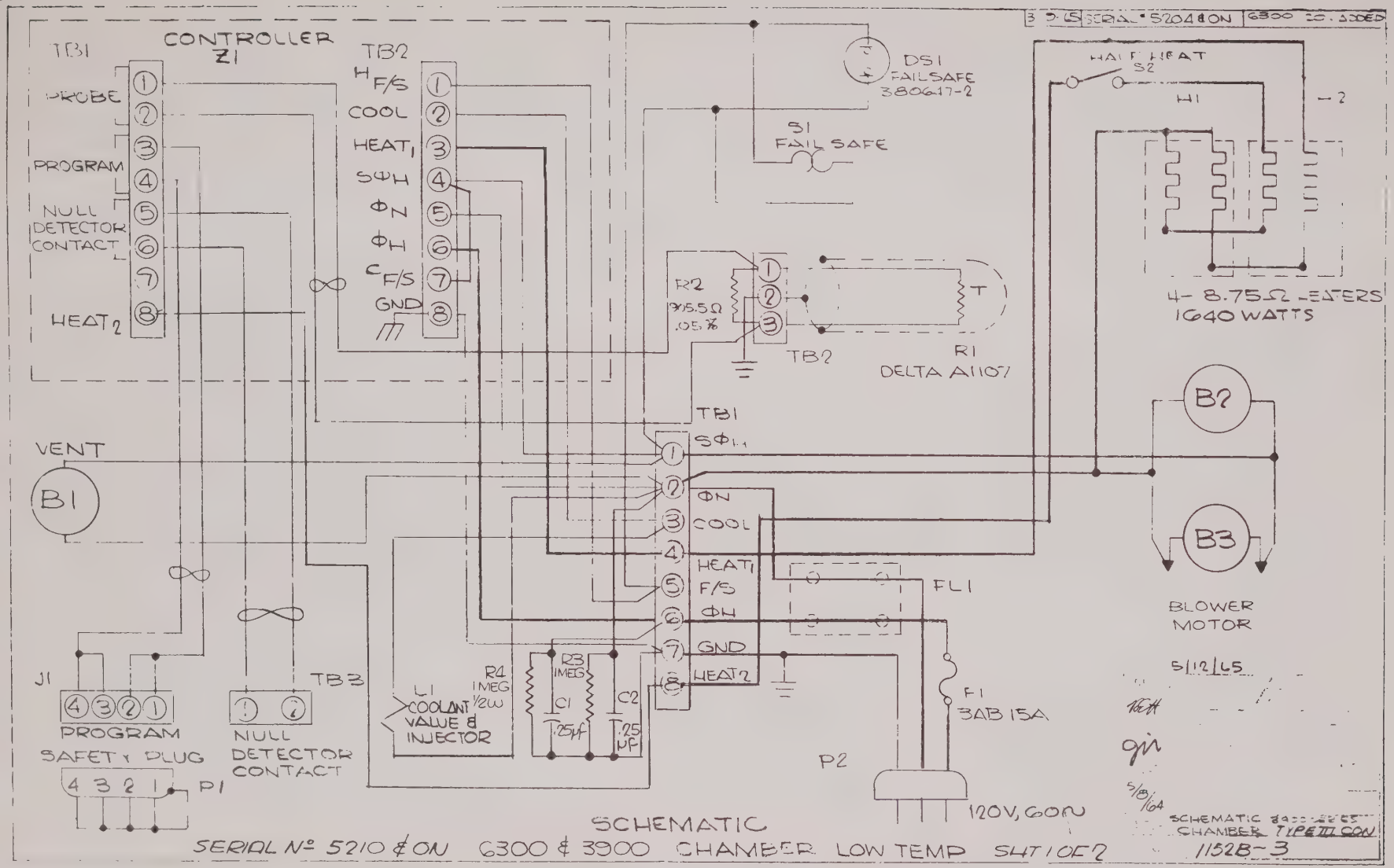
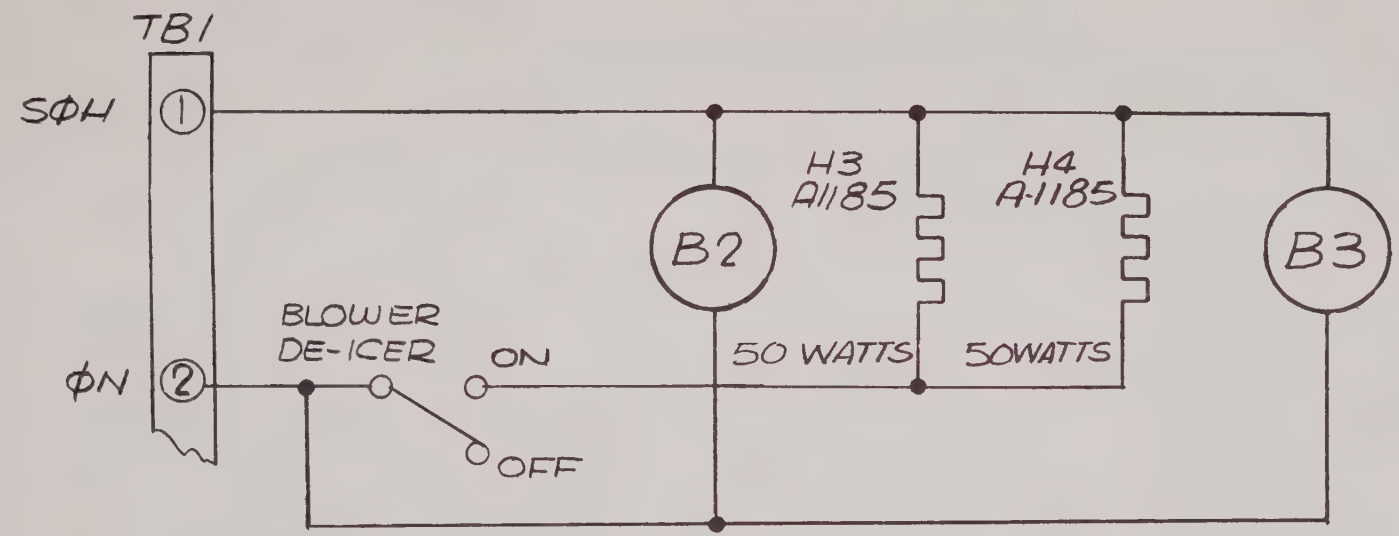


FIG. 19A PAGE 30



ADDENDUM

APPLICABLE TO THE 2300, 3900, 6300, 2800 LOW TEMPERATURE CHAMBER WHEN USED AT -300°F.

DASH Nº	REF DESIG	DESCRIPTION	DELTA PT #	USED ON
1	B2	MOTOR BLOWER ASSY FOR LN_2	A-1186	MK 2300, 3900, 6300 2200, 3800, 6200
2	B3	MOTOR BLOWER ASSY FOR LN_2	A-1187	MK 3900 & 3800
3	B3	MOTOR BLOWER ASSY FOR LN_2	A-118[illegible]	MK 2300, 3900, 6300 2200, 3800, 6200

REH 4/26/65
REH 2/10/65

DRN. REH	
APP.	[illegible] PARKWAY [illegible] CALIF.
DATE 10/9/64	NEXT ASSY
TITLE ADDENDUM SCHEMATIC	
D-G. NO. 1185A-3	

SERIAL Nº 5201 & ON

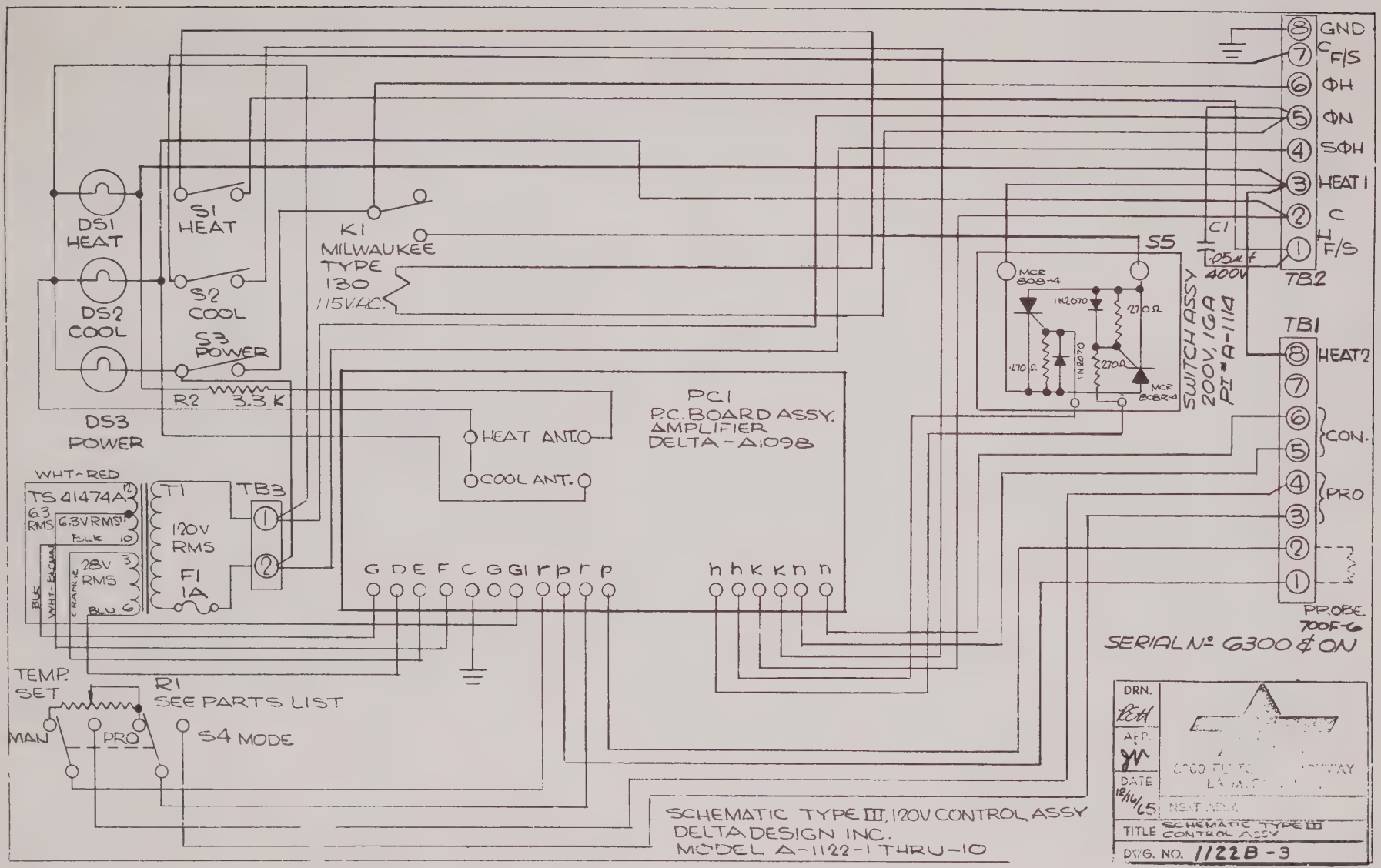


FIG. 20 PAGE 32

PARTS LIST

DWG. NO. 1122A-4

SHT. 1 OF 3

TITLE Controller Assembly
Delta Design, Inc. A1122-1

TYPE 111
THROUGH -10

DELTA DESIGN, INC. LA MESA, CALIF.

DASH NO.	REF. DES.	NO. REQ.	DESCRIPTION	COM'L. PT. NO.	MF'R.	DELTA PT. NO.	
1			Sales Outline				N/A
2			Sheet Metal Parts List				
3			Schematic				
4			Parts List				
5			Wiring Schedule				N/A
6			Wiring Diagram				N/A
7			Mech. & Elec. Assy				N/A
8	DS1	1	Indicator Lamp Assy-Red		Sylvania	A-1014	
9	DS2	1	Indicator Lamp Assy-Green		Sylvania	A-1015	
10	DS3	1	Indicator Lamp Assy-White		Sylvania	A-1013	
11	F1	1	Fuse 1A	3AB1A			
12	K1	1	Relay, SPDT 115V AC	130	Milwaukee	A-1446	
13	PC1	1	Amplifier Printed Circuit Assy.		Delta	A-1098	
14	R1	1	Potentiometer	See Attached	Page		
15	R2	1	Resistor, Carbon Comp.	3.3K ½W 5%			
16	S1	1	Switch, SPST	1730	H.H.Smith	K-2201	
17	S2	1	Switch, SPST	1730	"	K-2201	
18	S3	1	Switch, SPST	1730	"	K-2201	
19	S4	1	Switch, Rotary	T207	IRC	K-2202	
20	S5	1	Switch Assy SCR, 200V, 16 Amp		Delta	A-1114	
21	T1	1	XMFR	TS41474A	Transonics	K-2300	
22	TB1	1	Terminal Board	8 PL.Kliptite	Kulka	A-1109	
23	TB2	1	Terminal Board	8 PL.Kliptite	Kulka	A-1109	
24	TB3	1	Terminal Board	2-140	Cinch Jones	A-1084	

PARTS LIST

DWG. NO. 1122A-4

SHT. 2 OF 3

TITLE Controller Assembly
Delta Design, Inc. A1122-1

TYPE III
THROUGH -10

DELTA DESIGN, INC. LA MESA, CALIF.

DASH NO.	REF. DES.	NO. REQ.	DESCRIPTION	COM'L. PT. NO.	MF'R.	DELTA PT. NO.	
25	XF1	1	Fuse Holder	3560001	Littlefuse	A-1115	
26		1	Dial Assembly		Borg	K-1300	
27		1	Knob		Rogan	K-1301	
28		2	Spacers, Heat Sink	7269634	Delco	A-1117	
29		1	Terminal Strip, 2 Pin	1088	H.H.Smith	A-1116	
30		13	#6-32 Swage Nut		Southco		
31		4	1/4" Standoff		Cambion		
32		12	#6-32 x ½L Round Head Screw				
33		8	#6-32 x ¼L Round Head Screw				
34		1	#6-32 x 3/8 Flat Head Screw				
35		4	#4-40 x 3/8 Round Head Screw				
36		1	Spacer, 10 Turn Pot.		Delta	A-1149	

PARTS LIST

Dwg.No. 1122A-4
Sheet 3 of 3

Controller Assembly, 120V, Type III
Delta Design, Inc. A1122-1 through -10

DELTA DESIGN, INC. LA MESA, CALIFORNIA Appd Date

Model No.	Temperature Range	Potentiometer	Delta No.	Config.	Panel
A1122-1	-100°F+600°F	7⅓T 450 ohm/10T	A1024	Vert°F	1122A-2-1
A1122-2	-100°F+600°F	7⅓T 450 ohm/10T	A1024	Horiz°F	1122A-2-4
A1122-3	- 73°C+315°C	4 T 396 Ohm/5T	A1097	Vert°C	1122A-2-1
A1122-4	- 73°C+315°C	4 T 396 ohm/5T	A1097	Horiz°C	1122A-2-4
A1122-5	-300°F+600°F	9⅓T 450 ohm/10T	A1137	Vert°F	1122A-2-1
A1122-6	-300°F+600°F	9⅓T 450 ohm/10T	A1137	Horiz°F	1122A-2-4
A1122-7	-100°F+1000°F	11½T 567 ohm/15T	K1805	Vert°F	1122A-2-1
A1122-8	-100°F+1000°F	11½T 567 ohm/15T	K1805	Horiz°F	1122A-2-4
A1122-9	-300°F+1000°F	13½T 567 ohm/15T	K1806	Vert°F	1122A-2-1
A1122-10	-300°F+1000°F	13½T 567 ohm/15T	K1806	Horiz°F	1122A-2-4

PARTS LIST

DWG. NO. 1137C-4

TITLE Printed Circuit Board
Delta Design, Inc. A-1098

TYPE 3 THROUGH

SHT. 1 OF 6

DELTA DESIGN, INC. LA MESA, CALIF.

DASH NO.	REF. DES.	NO. REQ.	DESCRIPTION	COM'L. PT. NO.	MF'R.	DELTA PT. NO.	
1			Sales Outline				N/A
2			Sheet Metal Parts List				N/A
3			Schematic				
4			Parts List				
5			Wiring Schedule				N/A
6			Wiring Diagram				N/A
7			Mech. &Elec. Assy				N/A
8	C1	1	Capacitor Electrolytic	250M.F.50V	Cornell Dubilier	K-1100	
9	C2	1	Capacitor Electrolytic	47 M.F.25V	"		
10	C3	1	Capacitor Electrolytic	10 M.F.25V	"		
11	C4	1	Capacitor Electrolytic	10 M.F.25V	"		
12	C5	1	Capacitor Electrolytic	220M.F. 12V	"		
13	C6	1	Capacitor Disc.	.01 M.F.600V	Centralab		
14	C7	1	Capacitor Disc.	.01 M.F.600V	"		
15	C8	1	Capacitor Electrolytic	47 M.F. 25V	Cornell Dubilier		
16	C9	1	Capacitor Disc	.01 M.F.600V	Centralab		
17	C10	1	Capacitor Electrolytic	10 M.F.25V	"		
18	C11	1	Capacitor Electrolytic	10 M.F.25V	"		
19	C12	1	Capacitor Electrolytic	47 M.F.25V	"		
20	C13	1	Capacitor Electrolytic	220 M.F. 12V	"		
21	CR1	1	Diode, 1A 400V PIV	1N2070	I.T.T.	A-1031	
22	CR2	1	Diode, Zener 22V	1N3028	Motorola		
23	CR3	1	Diode, 1A 50 V PIV	1N4001	Motorola	A-1235	
24	CR3	1	Diode, 1A 50 V PIV	1N4001	"	A-1235	

PARTS LIST

TITLE Printed Circuit Board Type 3 Delta Design, Inc. A-1098 TYPE THROUGH

DWG. NO. 1137C-4

SHT. 2 OF 6

DELTA DESIGN, INC. LA MESA, CALIF.

DASH NO.	REF. DES.	NO. REQ.	DESCRIPTION	COM'L. PT. NO.	MF'R.	DELTA PT. NO.	
25	CR5	1	Diode, Zener, 2V	1N 702	Dixon		
26	CR6	1	Diode, Zener 6V	1N 706	Dixon		
27	CR7	1	Diode,IA 50V PIV	1N 4001	Motorola	A-1235	
28	CR9	1	Diode, 1A 50V PIV	1N 4001	Motorola	A-1235	
29	CR10	1	Diode, 1A 50V PIV	1N 4001	Motorola	A-1235	
30	CR11	1	Diode, 1A 50V PIV	1N4001	Motorola	A-1235	
31	CR12	1	Diode, 1A 50V PIV	1N 4001	Motorola	A-1235	
32	CR13	1	Diode,1A 50V PIV	1N4001	Motorola	A-1235	
33	CR14	1	Diode, 1A 50V PIV	1N4001	Motorola	A-1235	
34	CR15	1	Diode, 1A 50V PIV	1N4001	Motorola	A-1235	
35	CR16	1	Diode, 1A 50V pIV	1N 4001	Motorola	A-1235	
36	CR17	1	Diode, 1A 50V PIV	1N 4001	Motorola	A-1235	
37	CR23	1	Diode, Zener 2V	1N 702	Dixon		
38	CR24	1	Diode, 1A 50V PIV	1N4001	Motorola	A-1235	
39	CR25	1	Diode, 1A 400V PIV	1N2070	I.T.T.	A-1031	
40	CR26	1	Diode, 1A400V PIV	1N2070	I.T.T.	A-1031	
41	CR27	1	Diode, 1A 400V PIV	1N 2070	I.T.T.	A-1031	
42	CR28	1	Diode, 1A 400V PIV	1N 2070	I.T.T.	A-1031	
43	K1	1	Relay, Reed	PC-1AX-12X	Phipps	A-1244	
44	K2	1	Relay, Reed	PC-1AX-12X	"	A-1244	
45	K3	1	Relay, Reed	PC-1AX-12X	"	A-1244	
46	PC1	1	Printed Circuit Board		Delta	A-1098	
47	R1	1	Resistor, Carbon Comp.	680 ohms 1/2W, 5%	Stackpole		
48	R2	1	Resistor, Carbon Comp.	820 ohms 1/2W, 5%	"		

PARTS LIST

DWG. NO. 11370-4

TITLE Printed Circuit Board, Type 3 Delta Design, Inc. A-1098 TYPE THROUGH

SHT. 3 OF 6

DELTA DESIGN, INC. LA MESA, CALIF.

DASH NO.	REF. DES.	NO. REQ.	DESCRIPTION	COM'L. PT. NO.	MF'R.	DELTA PT. NO.	
49	R3	1	Resistor	F.A.	Stackpole		
50	R4	1	Resistor, Carbon Comp.	1K ½W, 5%	Stackpole		
51	R5	1	Resistor, Carbon Comp.	560 ohm ½W, 5%	"		
52	R6	1	Resistor, Carbon Comp.	F.A.	"		
53	R7	1	Resistor, Carbon Comp.	2.2K ½W, 5%	"		
54	R8	1	Resistor, Carbon Comp.	4.7K ½W, 5%	"		
55	R9	1	Resistor, Wire Wound	600 ohm CMR 50, 1%	Conrad Carson	A-1056	
56	R10	1	Resistor, Carbon Comp.	2.2K ½W, 5%	Stackpole		
57	R11	1	(Potentiometer) Resistor, 20T, W.W., 20 ohm	200P-1-200	Bourns	A-1099	
58	R12	1	Resistor, Carbon Comp.	2.2K ½W, 5%	Stackpole		
59	R13	1	Resistor	F.A	Stackpole		
60	R14	1	Resistor, Carbon Comp.	15K ½W, 5%	Stackpole		
61	R15	1	Resistor, Carbon Comp.	1.2K ½W, 5%	"		
62	R16	1	Resistor, Carbon Comp.	4.7 K ½W, 5%	"		
63	R17	1	Resistor, Carbon Comp.	10K ½W, 5%	"		
64	R18	1	Resistor, Carbon Comp.	10K ½W, 5%	"		
65	R19	1	Resistor, Carbon Comp.	10K ½W, 5%	"		
66	R20	1	Resistor, Carbon Comp.	1.2K ½W, 5%	" "		
67	R21	1	Resistor, Carbon Comp.	1K ½W, 5%	"		
68	R22	1	Resistor, Carbon Comp.	4.7K ½W, 5%	"		
69	R23	1	Resistor, Carbon Comp.	4.7K ½W, 5%	"		
70	R24	1	Resistor, Carbon Comp.	4.7K ½W, 5%	"		
71	R25	1	Resistor, Carbon Comp.	4.7K ½W, 5%	"		
72	R26	1	Resistor, Carbon Comp.	680 ohms ½W, 5%	"		

PARTS LIST

DWG. NO. 1137C-4

SHT. 4 OF 6

TITLE Printed Circuit Board, Type 3 TYPE
Delta Design, Inc. A-1098 THROUGH

DELTA DESIGN, INC. LA MESA, CALIF.

DASH NO.	REF. DES.	NO. REQ.	DESCRIPTION	COM'L. PT. NO.	MF'R.	DELTA PT. NO.
73	R27	1	Resistor, Carbon Comp.	2.2K ½W, 5%	Stackpole	
74	R28	1	Resistor, Carbon Comp.	680 ohms ½W, 5%	"	
75	R29	1	Resistor, Wire Wound	118 ohms CMR-50, 1%	Conrad Carson	A-1100
76	R30	1	Resistor	F.A	Stackpole	
77	R31	1	Resistor, Carbon Comp.	1K ½W, 5%	Stackpole	
78	R32	1	Resistor, Wire Wound	530 ohms CMR-50, 1%	Conrad Carson	A-1101
79	R33	1	(Potentiometer) Resistor, 20T,100 ohm WW	200P-1-101	Bourns	A-1102
80	R34	1	Resistor,Temp.Sensitive	F.A	Delta	
81	R35	1	Resistor	F.A	Stackpole	
82	R36	1	Resistor, Carbon Comp.	3.3K ½W, 5%	Stackpole	
83	R37	1	Resistor, Carbon Comp.	6.8K ½W,5%	Stackpole	
84	R38	1	Resistor, Carbon Comp.	6.8K ½W, 5%	"	
85	R40	1	Resistor, Carbon Comp.	3.3K ½W, 5%	"	
86	R41	1	Resistor	F.A	"	
87	R42	1	Resistor, Carbon Comp	27K ½W, 5%	"	
88	R43	1	Resistor, Carbon Comp.	18K ½W, 5%	Stackpole	
89	R44	1	Resistor, Carbon Comp.	4.7 K ½W 5%	"	
90	R45	1	Resistor, Carbon Comp.	1.2K ½W, 5%	"	
91	R46	1	Resistor, Carbon Comp.	5.6K ½W, 5%	"	
92	R47	1	Resistor, Carbon Comp.	5.6K ½W, 5%	"	
93	R 48	1	Resistor, Carbon Comp.	1K ¼W, 5%	"	
94	R49	1	Resistor, Carbon Comp.	12 K ½W, 5%	"	
95	R50	1	Resistor, Carbon Comp	1.2K ½W, 5%	"	
96	R51	1	Resistor, Carbon Comp.	1 K ½W, 5%	"	

PARTS LIST

DWG. NO. 11370-4

SHT. 5 OF 6

TITLE Printed Circuit Board, Type 3 Delta Design, Inc. A-1098 TYPE THROUGH

DELTA DESIGN, INC. LA MESA, CALIF.

DASH NO.	REF. DES.	NO. REQ.	DESCRIPTION	COM'L. PT. NO.	MF'R.	DELTA PT. NO.	
97	R52	1	Resistor, Carbon Comp.	27K ½W, 5%	Stackpole		
98	R53	1	Resistor, Carbon Comp.	4.7 K ½W, 5%	"		
99	R54	1	Resistor, Carbon Comp.	4.7 K ½W, 5%	"		
100	R55	1	Resistor, Carbon Comp.	18K ½W, 5%	"		
101	R56	1	Resistor, Carbon Comp.	4.7 K ½W, 5%	"		
102	R57	1	Resistor, Carbon	10.K ½W, 5%	"		
103	R58	1	Resistor, Temp. Sensitive	F.A.	Delta		
104	R59	1	Resistor, Power	8.2K 3W, 5%	Ohmite		
105	R60	1	Resistor, Carbon Comp.	100 ohms ½W, 5%	Stackpole		
106	R61	1	Resistor, Carbon Comp.	100 Ohms ½W, 5%	"		
107	R62	1	Resistor, Carbon Comp.	270 ohms ½W, 5%	"		
108	R63	1	Resistor, Carbon Comp.	270 ohms ½W, 5%	"		
109	R64	1	Resistor, Power	8.2K 3W, 5%	Ohmite		
110	SCR1	1	Silicon Cont. Rectifier	C22B	G.E.	A-1104	
111	Q1	1	Transistor	2N1535	Motorola		
112	Q2	1	Transistor	2N1302	Texas Instr.		
113	Q3	1	Transistor	2N3565	Fairchild		
114	Q4	1	Transistor	2N3565	Fairchild		
115	Q5	1	Transistor	2N3565	Fairchild		
116	Q6	1	Transistor	2N3638	Fairchild		
117	Q7	1	Transistor	2N3565	Fairchild		
118	Q8	1	Transistor	2N3565	Fairchild		
119	Q9	1	Transistor	2N3565	Fairchild		
120	Q10	1	Transistor	2N1302	Texas Inst.		

PARTS LIST

DWG. NO. 1137C-4

SHT. 6 OF 6

TITLE Printed Circuit Board, Type 3 Delta Design, Inc. A-1098 TYPE THROUGH

DELTA DESIGN, INC. LA MESA, CALIF.

DASH NO.	REF. DES.	NO. REQ.	DESCRIPTION	COM'L. PT. NO.	MF'R.	DELTA PT. NO.	
121	Q11	1	Transistor	2N1302	Texas Inst.		
122	Q12	1	Transistor	2N3638	Fairchild		
123	Q13	1	Transistor	2N3565	Fairchild		
124	Q14	1	Transistor	2N3565	Fairchild		
125	Q15	1	Transistor	2N3565	Fairchild		
126	Q16	1	Transistor	2N3638	Fairchild		
127	Q17	1	Transistor	2N1302	Texas Inst.		
128	Q18	1	Transistor	2N3565	Fairchild		
129	Q19	1	Transistor	2N3565	Fairchild		
130	Q20	1	Transistor	2N3565	Fairchild		
131	Q21	1	Transistor	2N3565	Fairchild		
132	Q22	1	Transistor	2N3565	Fairchild		
133	Q23	1	Transistor	2N3638	Fairchild		
134		22	Transistor Pads	T1-103	Canseat		
135		4	Terminal, Solder	1010-2	Cambion		
136		4	Terminal, Solder	2080-2	Cambion		
137		1	Anticipator Cover			A-1105	
138		2	Screw, Pan HD PH	#4-40 x 3/4			
139		2	Nickel Plate Screw, Pan HD PH	#4-40 x 5/16			
140		2	Nickel Plate Screw, Pan HD PH	#6-32 x 3/8			
141		4	Nuts	#4-40			
142		2	Nuts, Nickel Plate	#4-40			
143		2	Nuts, Nickel Plate	#6-32			
144		2	Washer, Flat, Nickel Plate	#6			

PARTS LIST

DWG. NO. 1152A-4

TITLE MK 6300 Temperature Chamber TYPE III THROUGH 5204 & on

SHT. 1 OF 2

DELTA DESIGN, INC. LA MESA, CALIF.

DASH NO.	REF. DES.	NO. REQ.	DESCRIPTION	COM'L. PT. NO.	MF'R.	DELTA PT. NO.	
1			Sales Outline				
2			Sheet Metal Parts List				
3			Schematic				
4			Parts List				
5			Wiring Schedule				
6			Wiring Diagram				
7			Electro-Mech. Assy.				
8	B1	1	Blower Motor, Vent	WS2107F	IMC	A-1032	
9	B2	1	Blower Motor, Right C. W.	140 CFM	Delta	C-2502	
10	B3	1	Blower Motor, Right C. W.	140 CFM	Delta	C-2502	
11	C1	1	Capacitor, Paper	.25 MF/400V	Cornell Dubilier		
12	C2	1	Capacitor, Paper	.25 MF/400V	"		
13	DS1	1	Indicator Lamp Assy	Type 3	AMP	A-1112	
14	F1	1	Fuse 15A	3AB15A	Littlefuse	A-1035	
15	H1	1	Heater Assy, Dual 820W 8.75 ohms		Delta	A-1121	
16	H2	1	Heater Assy, Dual 820W 8.75 ohms		Delta	A-1121	
17	J1	1	Connector, Panel	91-PC4F	Amphenol	K-1202	
18	L1	1	Valve & Injector Assy Dual, (Bench)	900 psi	Delta	A-1271	
19	OR	1	Valve & Injector Assy (Rack)	900 psi	Delta	A-1304	
20	OR	1	Valve & Injector Assy Dual, (Bench)	300 psi	Delta	A-1303	
21	OR		Valve & Injector Assy (Rack)	300 psi	Delta	A-1305	
22	OR		LN_2 Assy (Bench)		Delta	A-1367	
23	OR		LN_2 Assy (Rack)		Delta	A-1368	
24	P1	1	Power Cord Assy	14/3C SO 660V	Delta	A-1113	

PARTS LIST

DWG. NO. 1152A-4

TITLE MK 6300 TEMPERATURE CHAMBER TYPE III THROUGH 5204 & on

SHT. 2 OF 2

DELTA DESIGN, INC. LA MESA, CALIF.

DASH NO.	REF. DES.	NO. REQ.	DESCRIPTION	COM'L. PT. NO.	MF'R.	DELTA PT. NO.	
25	P2	1	Safety Plug		Delta	A-1010	
26	R1	1	Probe	56F11F	Lewis	A-1107	
27	R2	1	Resistor, Wire Wound	.05% 905.5 ohms	ConradCarson	A-1055	
28	R3	1	Resistor, Comp.	5% 1 Meg. 1/2W	Stackpole		
29	R4	1	Resistor, Comp.	"	"		
30	S1	1	Thermoswitch	TD1C22-4	Calstat Vulcan	A-1083	
31	TB1	1	Terminal Board, 8 pos.	699-8	Kulka	A-1109	
32	TB2	1	Terminal Board, 3 pos.	3-140	Cinch Jones	A-1110	
33	TB3	1	Terminal Board, 2 pos.	2-140Y	"	A-1084	
34	XF1	1	Fuseholder	356001	Littlefuse	K-1501	
35	FL1	1	Filter Line	16 amp	Delta	C-1602	
36	Z1	1	Controller, Type III		Delta	A-1122	
37		1	Flex Drive	3XK2	F. W. Stewart	A-1156	
38		1	Terminal Strip, 2 pts.	863	H. H. Smith	A-1116	
39		1	Thermometer 8"		Delta	C-3100	
40		4	Rubber Feet	BH-2069W	Accurate Rubber Co.		

FIELD BULLETIN # 16

TO: ALL FIELD PERSONNEL DATE: 4-25-66

SUBJECT: PRECISE CALIBRATION OF DELTA TYPE III CHAMBER CONTROLLER SYSTEMS.

Questions about the accuracy of the calibrating procedure as contained in the Type III Instruction Manual on Page 20 need to be answered and clarified.

The procedure and values used in the alignment of the controller are only approximate and consist of the average values assuming perfect matching of the set point potentiometer and the temperature probe.

After a controller-chamber system is adjusted to a "ballpark" calibration by means of the procedure as outlined on Page 20, it can be very precisely calibrated by means of an additional procedure. This additional procedure and precise calibration is particularly useful in ultra-accurate calibrations of chamber controllers over specific narrower operating ranges as might be appropriate and desired by customers using the chambers in the testing of semiconductor devices, etc. (-65°C to +150°C).

PROCEDURE:

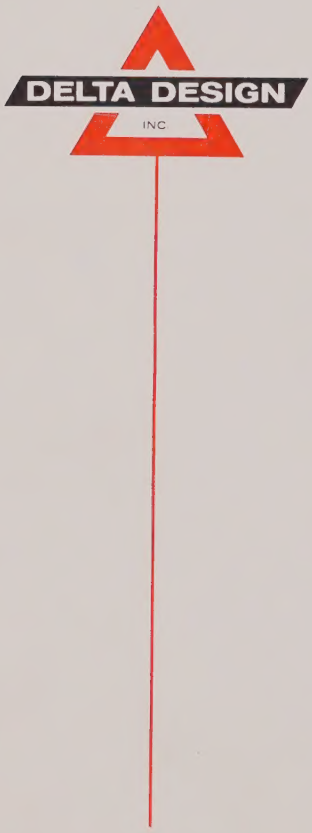
1. Calibrate the chamber as outlined on Pages 20 and 21 of the Instruction Manual.

2. Install a temperature measuring thermocouple or resistance bulb sensor in the center of the workspace of the chamber and close the chamber door.

3. Read and record the actual measured chamber temperatures, over the range of interest, for specific dial settings. An example of this is shown below:

Dial Setting	Measured Temperature
- 50°C	- 51°C
0°C	0°C
+100°C	+102°C
+150°C	+153°C

4. Remove the probe input leads to the controller. These are terminals 1 and 2 of TB1 on the controller. These are the two top terminals of the left hand board looking at the rear of the unit from the back. Notice which wire goes to which terminal so they can be put back as originally connected. Connect a resistance box (such as General Radio



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